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FLUSHING

THE flushing of ewes before they go to the ram is now widely accepted as one of the main essentials for a good lamb crop. But it's difficult to be dogmatic on what is the best treatment for ewes between weaning and flushing. There is, in fact, considerable evidence to suggest that prolonged starvation during this period in small paddocks may be positively dangerous.

The ewe that is considered to be over-fit at tupping time can subsequently face a store period without ill effects, provided she is put on a rising plane of nutrition during the last six weeks of pregnancy. Whether the ewe is in rising condition or in peak condition prior to service is of little consequence—but in good condition she must be. If the autumn grass growth is plentiful then flushing is simplified. All she needs is a good field of clean, fresh grass, sufficient for a flushing period of at least a fortnight—preferably three weeks—before the ram is turned in. A similar field should be reserved for the first fortnight of the tupping period.

After a summer of drought or grass scarcity, ewes need the best grass they can get, plus a pound per head per day of cereals. This will almost, though not quite, make up for any lack of grass.

To minimize the spread of lambing time, rams should not be overworked. Forty ewes to a mature ram or thirty for a well-grown ram lamb are about right and care must be taken to see that the ram is active and that few ewes return after the first sixteen days. Barren ewes or late-season lambs have a depressing effect on financial returns.

Intensive feeding of Friesian and cross-bred calves at the East Riding Institute of Agriculture has given average margins over cost of calves and feed of £23 per animal in 10–11 months

Grain-fed Beef

D. HURST and K. P. RILEY

FRIESIAN, Hereford x Friesian and Hereford x Blue Grey calves have been the subject of feeding experiments with whole concentrate and very restricted roughage and concentrate rations at the East Riding Institute of Agriculture since March, 1961. Friesian steer calves have been found the most suitable so far, reaching 7½–8 cwt in 10–11 months. They were three to four weeks ahead of the Hereford x Friesians. Calves of over 85 lb at birth, long between pins and hooks and having enough width to place two fingers between the shoulder blades, make excellent cattle for intensive feeding. It is in the first few weeks of calf rearing that success is laid down, making all the difference between profit and loss.

Home-bred calves have done best when left with their dams for 3–4 days, then gradually weaned on to a good calf milk substitute. Calves reared in this way, obtaining colostrum, have not been found to need antibiotics added to their milk substitute. Should there be a history of calf scours and other ailments, it is advisable to include a low level of antibiotic for 3–4 days when the calf is given milk substitute (e.g., 100 mg of Aurofac D will be adequate). The navels of all calves are dressed with antiseptic as soon after birth as possible.

Rearing bought-in calves

Bought-in calves are more difficult to rear. Our system with these is to give them, on arrival, 1 pint of *warm* water with the following included: 4 oz glucose, 100 mg Aurofac D (1 level tablespoon), 1 dessertspoon cod liver oil, and 1 teaspoon salt. The second feed is exactly the same as the first, except that only 50 mg of Aurofac D (1 level dessertspoon) is used. From the third feed a good calf milk substitute is gradually introduced, and 50 mg of Aurofac D is added for the first seven days. The substitute should be thoroughly whisked and the manufacturer's instructions carefully followed.

The calves are fed three times a day in the first week in individual pens, and then twice a day. A palatable early weaning mix (see below) is offered to the calves from the third day. Hay is available until they are 12 weeks old. Where racks are not available in small pens, the hay is chopped with an old chaff cutter and mixed with the early weaning mix on the basis of 10 per cent by weight.

Early Weaning Mix

per cent	
40	Flaked maize
22½	Rolled oats or barley
7½	Molassine meal
30	Early weaning meal or pellets

When the calves are 5–6 weeks old and are eating 1½ lb per head per day of the early weaning mix, they are abruptly weaned from calf milk substitute. The early weaning mix is then fed *ad lib.* from hoppers or troughs large enough for rather more than one full day's feed. Clean water is not made available until the calves have been receiving milk substitute for at least 3 weeks, by which time they are either housed in groups or left in small individual pens.

Clean, warm and suitably ventilated accommodation is essential. The temperature should not vary much (ideally 55–60°F). Individual calf pens for the first 3–5 weeks are preferred so that calves do not suckle one another and so pass on any infection from navel to navel. We have found metal-sided pens too cold for calves; pens made from wooden hurdles or straw bales are much better. After each group of calves has been reared, the hurdles are removed and dipped in a creosote soaking tank. The pens are thoroughly scrubbed, disinfected and subsequently left for one week before using again. Cleanliness is undoubtedly of paramount importance—each calf has its own 'milk' bucket, which is thoroughly sterilized before the next feed.

Young Friesian steer weighing 7¾ cwt at 10½ months. Hindquarters well developed and a good second thigh

From twelve weeks to finish

By the time the calves are 12 weeks old they are usually eating at least 5 lb of dry food per day and weigh about 220 lb. From this stage the final fattening ration is gradually introduced over a period of 3–4 weeks, so that by the time the calves are 16–18 weeks old they are on the final fattening mix. The food should be fed from hoppers (3 in. length per animal) and is never allowed to run out.

The steer calves are castrated by knife when they are approximately $6\frac{1}{2}$ months old or weighing 550 lb. Immediately following this operation the calves are implanted with 60 mg of hexoestrol. Implanted castrates have been found to gain 17–20 per cent faster than non-implanted steers, reaching slaughter stage three weeks earlier.

Choice of main grain in the ration

When Dr. Preston first introduced the system of whole concentrate feeding he suggested a fattener ration consisting of 85 per cent rolled barley and 15 per cent of a protein/vitamin/mineral supplement—hence 'Barley Beef'. But other grains can be fed successfully so long as the fibre and food value (T.D.N. or total digestible nutrients) does not fall below that of a ration consisting of 85 per cent rolled barley. The comparative feeding value of cereals is given below. Note particularly the low fibre content of wheat, maize and sorghum. A high vitamin A activity should be maintained in the total ration.

Feeding Value of Cereals

Ingredient	SE	PE	TDN %	Fibre %	I.U. Vitamin A per lb
Barley	71	7·2	74	4·5	333
Oats	60	7·6	65	10·3	83
Wheat	72	9·6	78	1·9	67
Maize	78	7·6	79	2·2	2,167
Sorghum	74	7·2	76	2·3	167

Rations fed successfully at the Institute are:

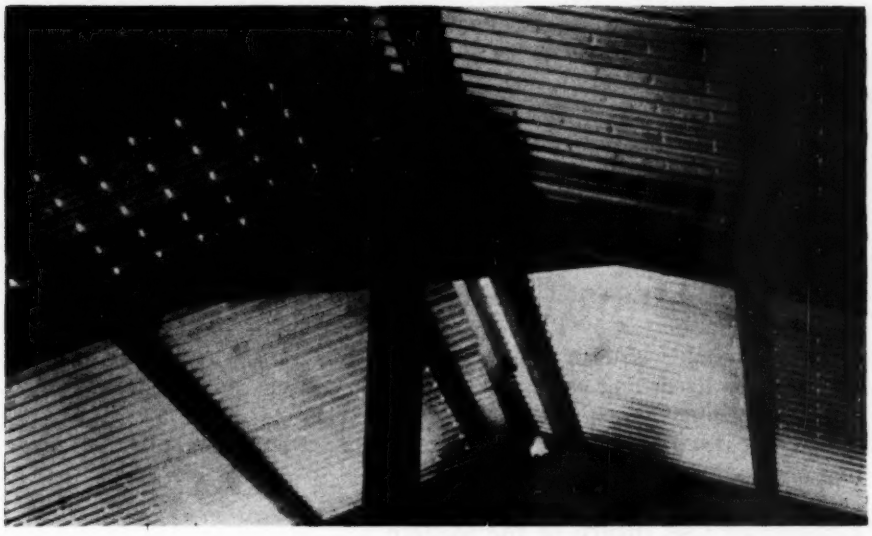
Fattener Rations

1.		2.		3.	
per cent		*per cent*		*per cent*	
85	Rolled barley	40	Cracked maize	30	Rolled wheat
15	Protein supplement	25	Rolled oats	15	Rolled oats
		20	Rolled barley	40	Rolled barley
		15	Protein supplement	15	Protein supplement

Grain rolled to a flaky texture has given the best results; milled grain tends to be too mealy and dusty.

Addition of cod liver oil

Although the protein/mineral/vitamin pellets as made for us do in fact contain a high level of synthetic vitamin A, there is some evidence from veterinary experience that the addition of cod liver oil may be beneficial. The oil content tends to reduce the dustiness of the ration and may, on American evidence, influence rumen activity favourably so that better conversions are obtained. At the moment recommendations for this addition can only be suggested, but we are working on the basis of 6 pints of cod liver oil per ton.



Internal roof structure of beef house, showing ventilated (ventrex) aluminium sheeting and insulated chimneys

Cubes versus meal feeding

Cubes are less dusty and appear more palatable than 'meal' rations, and the food conversion ratio is approximately 0·5 lb better where cubes are fed. Cubing costs approximately £3 per ton more—barely sufficient to justify the better food conversion ratio.

Limited hay feeding

A trial has just been completed with twenty-eight Friesian steers, bedded on shavings and allowed up to 1½ lb of hay per head per day and an *ad lib.* concentrate ration. The ration consisted of 70 per cent rolled barley, 15 per cent cracked maize, and 15 per cent protein/mineral/vitamin supplement. The total food cost per animal was £42 17*s.* 11*d.*, including £1 13*s.* 2*d.* worth of hay (costed at £10 per ton). The margin over feed and calf was £23 12*s.* This result is strictly comparable to our results where cattle have been fed *ad lib.* concentrates, bedded on straw and fed no hay. Their average age to slaughter was 11 months, compared with an average of 10¾ months with cattle fed on concentrates only. The grading results were 35 per cent Super, 57 per cent 'A', and 7 per cent 'B'.

Further similar trials are needed really to determine whether it is economically justifiable to include a small quantity of hay in the diet. All that can safely be said at this moment about including hay is that it is an additional safeguard against bloat. Reasonable safeguards do, however, lie in the texture of the ration, careful introduction of ration changes, and undisturbed continuous access to the food.

Slaughter weight and grading

In the latter stages of fattening the food conversion ratio, or the number of pounds of food required to put on 1 lb of live weight, increases markedly. It may be 6:1 and rise to over 7:1 in the last few weeks. Thus our steers

are sold as soon as they reach 7½ cwt and the cross-bred heifers 7 cwt, and have sufficient finish to ensure an 'A' grading. Holding on to the cattle until they reach weights much in excess of 8 cwt is generally uneconomic.

Health and disease

The chief problems we have met with intensive feeding have been pneumonia when calves are 3–4 months old, and bacillus and salmonella infections in the early calf-rearing stages. One steer out of over 250 cattle fed has been lost from bloat, and none from urinary calculi.

We are confident that losses can be reduced to a minimum with stricter aseptic precautions, a low level of antibiotic feeding in the early calf rearing stage and suitable housing. Cases of pneumonia can be reduced effectively by *gradually* hardening calves off from their warmer rearing quarters and avoiding feeding rations which are dusty or mealy.

Where losses do occur, they can normally be attributed to poor stockmanship and indifferently ventilated buildings.

Economics and future of the system

Housing for intensively fed cattle is worthy of special treatment. Suffice it to say that from our experience capital invested in new housing, grain and stock has been shown to be £40 per animal. This gives an approximate return on capital invested of 33 per cent where the net profit is estimated at £13 per animal.

A Quick Look at the Figures

Number of cattle reared, fed and sold: 210
Average margin over feed and cost of calf: £23 6*s.* 6*d.*
Average food cost: £37 6*s.*
Average calf cost: £12 10*s.*
Average gross income (incl. calf subsidy): £75 2*s.* 6*d.*
Average live weight at sale: 7¾ cwt
Average killing-out percentage: 57 per cent
Average grading results: 30 per cent Super, 60 per cent 'A', 10 per cent 'B'
Average age at slaughter: 10¾ months
Average food consumption:

Milk substitute	¼	cwt
Early weaning mix	4¼	,,
Fattening mix	27	,,
		31½ cwt

Average food conversion ratio: 4·8 : 1

There are still many problems to solve with the system, but it can be safely recommended to practising farmers so long as they maintain a very high standard of stockmanship.

Intensive beef production also offers the opportunity of regular marketing and levelling out the seasonal variation in returns.

The authors of this article are both at the East Riding Institute of Agriculture, Bishop Burton, Beverley, East Yorkshire. **K. P. Riley, M.A., N.D.D.H. (Hons.)**, is Principal of the Institute and **D. Hurst, B.Sc. (Agric.), M.S.**, is his Vice-Principal.
Previously, Mr. Riley was Deputy Principal, Farm Director and Senior Lecturer in Animal Husbandry at the Gloucestershire Farm Institute from 1949 to 1957. Mr. Hurst was Assistant Agricultural Organizer to the Shropshire Education Committee from 1950 to 1954. He has been concerned with intensive feeding trials of cattle and sheep since 1960, and he is a contributor to B.B.C. sound and television programmes as well as to the farming press.

Wheat for flour milling can be ruined if it is dried at too high a temperature

The Drying of Milling Wheat

E. N. GREER

MOST home-grown wheat has of necessity to be dried. Occasionally, however, wheat for flour milling is dried in a manner that leads to subsequent complaint, but when this happens it is fairly certain that the advice given by the Ministry of Agriculture to drier operators has not been followed. The advice about milling wheat is to dry it at a temperature not exceeding 150°F. This limit has been criticized as being unduly low, thus reducing the efficiency of driers in regard to speed and capacity; the effect of too great a heat on wheat is sometimes held to be relatively small and not important compared with preserving wet grain from deterioration caused by mould infection.

On this last point, any doubts about the drastic nature of the damage that can be caused by a drier may be settled by reference to the picture and diagram. They illustrate the complete reduction in bread quality that can occur and the equally disastrous effect on biscuit dough.

In brief, these changes are caused by what is virtually a slight cooking of the protein of the wheat, which, as is not uncommon among proteins, causes a complete change in physical properties; compare the cooking of lean meat or of egg white.

Buyers of milling wheat expect to get grain in its raw state, not part cooked; and since distinction between the two is impossible by visual examination, have a justifiable complaint.

It is therefore of general interest to decide how heat may be used in drying without causing this sort of damage.

Heat and germination

A very useful first guide to changes in wheat is its germination behaviour. If wheat is heated under controlled conditions and germination tests are applied, the first effect is a delay in germination. This lengthens as the severity of heat treatment is increased and finally reaches a point where the germination process will not start. It is at this point that deterioration of the

A loaf baked from normal English wheat flour contrasted with one baked from a similar flour, the protein of which has been damaged by drying in air at 180°F

protein of flour made from the wheat can be easily recognized, and though the extent of the damage can be increased by further heating, this killing of the wheat may be taken as a useful reference point in relating drying conditions to damage of wheat flour.

The conditions of heating which wheat can tolerate before its germination is affected were studied by Hutchinson (1944). He found that they depended on the temperature of heating, the moisture content of the grain, and the time of heating; these are quoted in the order of their importance. He also worked out from the experimental results a mathematical rule connecting these three factors. The rule need not be quoted here, but it makes possible the calculation of the time of exposure in which a grain may be killed, and hence its baking quality damaged, under various conditions of temperature and moisture content.

A sample of such calculation, which is useful in the present connection, is:

Temperature at which wheat germ is killed

Moisture content per cent	*In 1 minute deg. F*	*In 10 minutes deg. F*	*In 30 minutes deg. F*
15	174	164	159
17·5	168	158	153
20	164	154	149
22·5	160	150	145
25	156	146	141

There are two points worth noting about these figures: first, the enormous effect of temperature as compared with time of heating; second, the way in which increasing moisture content increases the sensitivity of wheat to heating.

Danger with tower and tray driers

Ventilated bins, drying platforms and 'in sack' driers do not come within the scope of these comments, since they do not operate at a sufficiently high air temperature. On the other hand, tower and tray driers can be, and are sometimes, operated above 200°F. The conditions in these are worth considering.

First of all there is the question of the rate at which wheat will exchange heat with the air around it. Wheat will heat through to almost the temperature of the air around it in about 20 seconds. Second, there is the question of the way in which water leaves the grain. Surface water is lost very quickly, but thereafter the drying rate is controlled by the relatively slow speed with which water will travel from the inside to the outside of the grain. Therefore the interior of the grain may be both hot and damp while the outside is hot but dry.

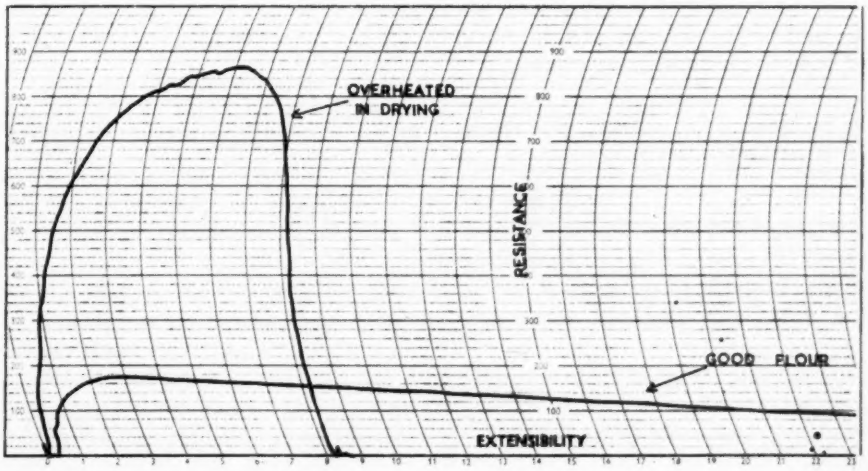
Last of all there is the question of whether all grains in a drier receive equal heat treatment. In the simple case in which the air passes through a virtually static bed of grain, it may be expected that in a 6-inch thick bed, under normal drying conditions, there will be a fall of some 20°F in the temperature of the air during its passage through the grain. The temperature falls reasonably constantly through the wheat, and a 6-inch bed is unlikely to be more than 40 grains thick; it may well be less.

Now take the case of wheat at 22·5 per cent moisture content being dried in air at 150°F. The maximum grain temperature reached will probably be 1 or 2 degrees less, and it will occur only in the layer, say, 2 grains thick. Suppose that the grain is effectively under heat in the drier for 30 minutes (this allows for warming up and subsequent cooling). Reference to the time, temperature and moisture content table shows that wheat will just reach the limiting conditions for damage, but possibly in only two out of every forty grains, or 5 per cent. If the same drying were to be carried out at 180°F, then the temperature drop across the column would be greater, perhaps 30°; but even so, it could be expected that only a small fraction of the grain would avoid damage.

Mixed grain

If this is the situation for static bed driers, it is worth considering those in which the grain is mixed, and accordingly to suppose that the mixing is perfect. If the bed is 40 grains thick, it can reasonably be expected that

An extensometer test of biscuit flour. The good flour showed low resistance and high extensibility; flour made from wheat overheated in drying showed exactly the reverse



each grain will be more than a minute in the hot zone. Again, taking the example wheat at 22·5 per cent moisture content, one can see that at best the temperature limit for avoiding damage is only some 15° higher than in the case of the unmixed grain and further that it requires much more rigid control, since perfect mixing will ensure damage to *all* the grain rather than to a small fraction of it.

Wheat and moisture

It has been shown that the wetter wheat becomes, the more sensitive it is to heat. The rules outlined already suggest a quantitative connection between permissible drying temperature and moisture content. It has also been noted that during drying the interior of a grain can remain wet whilst the outside is dry.

There are also other considerations; not all grains are harvested from a field at the same moisture content. According to maturity there may be variation in the spikelets of a single ear; there will certainly be variation between different tillers of the same plant. Equally, there will be variation from place to place in the field according to its very local climate (i.e., sunlight and shade, exposure to wind, etc.). Thus a sample of a few hundred grains taken for a moisture test may be expected to vary among individuals, and a good tester will show the average. These various grains may tend to equalize in moisture to a limited extent; but it is a reasonable guess that grains going to a drier, nominally at 22·5 per cent, will contain some grain with a moisture of not less than 25 per cent. This again points to the need for care in deciding on temperature limits for drying air.

Summarized

What has been said indicates that the official advice concerning the drying of milling wheat is amply justified. If it is disregarded milling wheat can easily be damaged.

1. The maximum air temperature for drying milling wheat should not exceed 150°F.
2. This limit should be reduced by 10 degrees: (*a*) if a tray drier is used; (*b*) if the grain is very wet, i.e., above 25 per cent moisture content.

If it is necessary to preserve grain by quick drying in hotter air, the wheat should not be sold for milling purposes, for it is likely to give serious trouble if used for normal flour milling.

E. N. Greer, B.Sc., A.R.I.C., is in charge of work on home-grown wheat at the Cereals Research Station, St. Albans.

Alec Calder's earlier instalments of the Gorstella story appeared in the February, 1959, and June, 1962, issues of 'Agriculture'.

THE CUT-and-CARRY SYSTEM is still giving high milk yields at low cost on Mrs. Chadwick's farm

A PROGRESS REPORT BY

Alec Calder

Grass at Gorstella

ZERO grazing has been going on at this 200-acre Cheshire farm since 1956. During that time no stock have been grazed. All grass for direct consumption, and most grass for silage, is cut by 'Gang-Mo Loader'.

What's the grass like?

The types of sward developed by continual gang mowing are of interest. The original permanent grassland on the farm is mainly in ridge and furrow, and is dominated by rough-stalked meadow grass, accompanied by a high percentage of timothy and some perennial ryegrass. Clover is virtually absent, but in one field drastic harrowing and broadcasting 12 lb perennial ryegrass and 2 lb Kersey white clover per acre has given a reasonable renovation. Although starting spring growth rather later than the leys, the ultimate annual yield from this sward has been comparable.

Reseeded leys based on timothy and meadow fescue were previously put down, and these generally carry a high percentage of sown species including clover. Rough-stalked meadow grass, which is indigenous in the area, tends to develop in these leys at an early stage and will dominate them after five or six years.

Because of this, a change to leys based on perennial ryegrass and timothy was made three years ago. By this means it was hoped to discourage the rough-stalked meadow grass but, in fact, the same thing has again occurred, though perhaps not as rapidly as in the timothy meadow fescue leys. Many

A 'Gang-Mo Loader' cutting grass at Gorstella. Its limited cutting height makes this machine ideal as a means of ensuring high quality herbage for the cows

of the leys on the farm have been down for seven or more years, and reseeding is now practised mainly to provide a dumping ground for farmyard manure in the summer.

Manuring

As far as possible in the winter, a light dressing of farmyard manure is applied to all fields. A complete fertilizer containing 12 per cent N, 12 per cent P_2O_5 and 18 per cent K_2O is applied each year in August at 4 cwt per acre over the whole farm. Additional nitrogen is used in accordance with the season. Until 1960 most swards had a high clover content (excluding the permanent grass), to such an extent that reliance was placed almost entirely on the clover for nitrogen supply. A summer drought in 1959 followed by a dry spring and an early summer in 1960 killed out most of the clover, and it became necessary to use increasing amounts of fertilizer nitrogen to ensure growth. Although clover has returned to some extent, the present policy is one of high nitrogen on fields of low clover content, and dressings of up to 180 units are now given.

Yields of grass

All grass is weighed as cut, over a weighbridge, and is sampled for dry matter. This averages 17 per cent over the summer but can be as high as 25 per cent in dry midsummer periods and as low as 12 per cent in wet conditions.

Yields of various fields in past three years

Type of sward	*Average units of N per acre*	*Yield of dry matter cwt per acre*
Permanent grass	150	60·7
Timothy/fescue leys	103	54·1
Ryegrass/timothy leys	130	65·0

The perennial ryegrass leys are all young—less than four years old. This may well explain their high yield. The results also show that permanent grass well manured with nitrogen can compare very favourably in yield with a ley. These figures are in no way the result of critical experiment but are merely the result of weighing total yield off each field.

Winter feeding

Summer feeding of the dairy herd has been described in the June, 1962, issue of this Journal. During the winter period (usually mid-November to mid-April) silage forms the major part of the cows' diet. 80–100 lb per cow per day is fed, according to the quantity available and the anticipated length of the winter. In addition, 3–8 lb of hay bought the previous summer is given. This hay is therefore in the nature of a 'safety valve' to allow for seasonal differences in grass yield.

Quality of silage is high, with crude proteins of 16–20 per cent in the dry matter. Starch equivalent averages 12, but it can vary between 9 and 14. The hay and silage together are assumed to provide for maintenance plus 2 gallons. A starch concentrate is fed at 4 lb per gallon for production over this level. No additional protein supplement is necessary with this high quality silage. Details of the winter feeding for the 1961–62 winter are:

No. of cows in herd	*Total silage used*	*Average no. of cows in milk*	*Average milk produced*	*Average concentrate use*
	tons		*Gal/cow/day*	*lb/gal*
111	790	94	3·2	2·32

The combined results of the winter and summer feeding policies for the year ended 31st March, 1962, were:

Average number of cows in herd	107
Acres per cow	1·7
Average yield (gal per cow)	1,115
% Winter milk	47
Average price of milk per gallon	33·6*d.*
Concentrate use per cow (cwt)	16·3
Concentrate use per gallon (lb)	1·64
Average cost of concentrate ration	24*s.* 9*d.*
Margin per cow milk over concentrate	£135·9
Cost of other purchased food per cow	£9·5
Margin per cow, milk over purchased feed	£126·4
Margin per acre milk over purchased feed	£73·1

It is thus seen that high yields can be achieved from a mainly grass diet. To a great extent they are due to the breeding of the herd, which consists of deep-framed Holstein cows of Canadian origin. High yields are frequently associated with high cost, but with the intensive methods of grassland adopted at Gorstella, it has been shown that the ideal of high yield at low cost is a sound proposition.

I am indebted to Mrs. J. Chadwick for permission to publish the foregoing information.

An enormous number of cows are discarded every year because of
PERMANENT INFERTILITY

Sold for not breeding

What went wrong?

F. L. M. Dawson

ABOUT 180,000 British cows are discarded each year for failure to breed. Various authorities have quoted survey percentages of 12–20 due to this cause, and to this cause alone, in our annual discard of about a million head. Similar figures are quoted by American writers for conditions in the United States. According to reports from New Zealand, Italy, and Holland, permanent infertility is the most important cause of culling due to disease, and in the latter two countries it was responsible for one-third of all cows discarded. Judging by three separate surveys in Bavaria, where the figure was about 70 per cent, it looks as if infertility is almost the sole cause of discard in those countries where family farming prevails.

Analysis of a cross-section

During the last ten years I have collected some 400 such cows of all breeds from about 130 farms. Post-mortem examinations were done in considerable detail after a study of the living animal lasting on average nearly two months. The table on page 371 shows the type of damage found in the breeding organs and, by contrast, the state of the organs in a control series of cows discarded for such reasons as poor yield and mastitis—though probably a few of these, too, would have failed to breed had service been tried.

The results suggest that some minor degree of damage to the womb lining does not prevent breeding, but that more severe destruction of tissue here is an important cause of infertility in itself, though not as important as blocked oviducts; most cows with these have damaged wombs as well. The table does not refer to the condition of the ovaries. Twenty-two per cent of the infertile cows were actually affected with cystic disease of the ovaries.

This includes only some of those classified as having a normal womb; 43 per cent of cystic cases had blocked oviducts as well and are included among the latter group in the table.

Information from other sources

Little other work along these particular lines has been carried out in this country, but a study of infertile cows in Japan showed 45 per cent with heavy damage to the womb lining and 40 per cent with ovarian cysts, as compared with only 20 and 12 per cent respectively in a large group of cows of unknown history presumably discarded for a variety of other reasons. Studies of a large number of genital organs collected at random in the abattoirs in Denmark and Finland gave the incidence of blockage of the oviduct as 10 and 15 per cent. As these organs were taken from apparently normal animals, certain assumptions have to be made if information on the percentage of cattle discarded for infertility is required in these two countries. Bearing in mind that blockage of the oviduct was responsible for 46 per cent of infertile cattle studied in this country, it may be assumed with some justification that the Danish and Finnish figures represent about 35 per cent discarded for infertility, which is the same as the actual Dutch figure. About 48 per cent of infertile ewes in New Zealand were found to have blocked oviducts, while it is thought that 30 per cent is an estimate, on the low side, of the incidence of this condition in sterile women.

Percentages of Control and Infertile Cattle classified by Extent of Damage to Breeding Organs

	Infertile	*Discarded for other reasons*
Womb normal	18	37
Slight damage to womb lining	12	36
		Half of these cows conceived to one experimental service each
Womb glands out of action and full of pus cells	14	9
Womb lining totally destroyed	6 } 24	—
Others with detritus in womb	4	—
Blockage in one or both oviducts	46	18
TOTAL	100	100

All this work suggests that blockage of the oviduct is an important cause of permanent infertility in all species of animals. To offset this, a number of reports on genitalia examined at random in abattoirs both in American and certain European countries suggest that only 2 or 3 per cent of infertile cows suffer from this condition.

I found that microscopical examination of tissue sections was necessary to detect over one-third of the oviduct block cases, whereas the reports referred to above seem to have been based on a visual examination of the organs, and the recording of obvious abnormalities.

Husbandry aspect

Work in most breeds, notably in Sweden, and confirmed in this country, has shown that there is a strong heritable tendency to cystic ovarian disease in certain strains of high-producing stock. The tendency can be transmitted through either parent. One bull produced 100 per cent of daughters who

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ABOUT 180,000 British cows are discarded each year for failure to breed. Various authorities have quoted survey percentages of 12–20 due to this cause, and to this cause alone, in our annual discard of about a million head. Similar figures are quoted by American writers for conditions in the United States. According to reports from New Zealand, Italy, and Holland, permanent infertility is the most important cause of culling due to disease, and in the latter two countries it was responsible for one-third of all cows discarded. Judging by three separate surveys in Bavaria, where the figure was about 70 per cent, it looks as if infertility is almost the sole cause of discard in those countries where family farming prevails.

Analysis of a cross-section

During the last ten years I have collected some 400 such cows of all breeds from about 130 farms. Post-mortem examinations were done in considerable detail after a study of the living animal lasting on average nearly two months. The table on page 371 shows the type of damage found in the breeding organs and, by contrast, the state of the organs in a control series of cows discarded for such reasons as poor yield and mastitis—though probably a few of these, too, would have failed to breed had service been tried.

The results suggest that some minor degree of damage to the womb lining does not prevent breeding, but that more severe destruction of tissue here is an important cause of infertility in itself, though not as important as blocked oviducts; most cows with these have damaged wombs as well. The table does not refer to the condition of the ovaries. Twenty-two per cent of the infertile cows were actually affected with cystic disease of the ovaries.

This includes only some of those classified as having a normal womb; 43 per cent of cystic cases had blocked oviducts as well and are included among the latter group in the table.

Information from other sources

Little other work along these particular lines has been carried out in this country, but a study of infertile cows in Japan showed 45 per cent with heavy damage to the womb lining and 40 per cent with ovarian cysts, as compared with only 20 and 12 per cent respectively in a large group of cows of unknown history presumably discarded for a variety of other reasons. Studies of a large number of genital organs collected at random in the abattoirs in Denmark and Finland gave the incidence of blockage of the oviduct as 10 and 15 per cent. As these organs were taken from apparently normal animals, certain assumptions have to be made if information on the percentage of cattle discarded for infertility is required in these two countries. Bearing in mind that blockage of the oviduct was responsible for 46 per cent of infertile cattle studied in this country, it may be assumed with some justification that the Danish and Finnish figures represent about 35 per cent discarded for infertility, which is the same as the actual Dutch figure. About 48 per cent of infertile ewes in New Zealand were found to have blocked oviducts, while it is thought that 30 per cent is an estimate, on the low side, of the incidence of this condition in sterile women.

Percentages of Control and Infertile Cattle classified by Extent of Damage to Breeding Organs

	Infertile		*Discarded for other reasons*
Womb normal	18		37
Slight damage to womb lining	12		36
			Half of these cows conceived to one experimental service each
Womb glands out of action and full of pus cells	14		9
Womb lining totally destroyed	6	24	—
Others with detritus in womb	4		—
Blockage in one or both oviducts	46		18
TOTAL	100		100

All this work suggests that blockage of the oviduct is an important cause of permanent infertility in all species of animals. To offset this, a number of reports on genitalia examined at random in abattoirs both in American and certain European countries suggest that only 2 or 3 per cent of infertile cows suffer from this condition.

I found that microscopical examination of tissue sections was necessary to detect over one-third of the oviduct block cases, whereas the reports referred to above seem to have been based on a visual examination of the organs, and the recording of obvious abnormalities.

Husbandry aspect

Work in most breeds, notably in Sweden, and confirmed in this country, has shown that there is a strong heritable tendency to cystic ovarian disease in certain strains of high-producing stock. The tendency can be transmitted through either parent. One bull produced 100 per cent of daughters who

eventually exhibited the disease when line-mated to cows of the same strain; very few of his outbred daughters were affected. There is also evidence that outbreaks can follow feeding on certain legume crops which happen to have an abnormally high content of a hormone similar in its effects to that produced by cows in heat. Just what induces such a hormone production remains unknown.

Inflammation of the womb usually becomes obvious during the month following calving. The main microbe involved is often present in healthy cattle without doing harm, but in disease cases some other deleterious factor appears to trigger it off—secondary endogenous infection.

The infection readily ascends from the womb into the oviducts, where it is even more likely to do permanent damage, and is much less susceptible to treatment. The incidence of inflammation is raised in cows which have had difficulty in giving birth, but also when twins are born and when the cleansing (placenta) is retained.

Placental retention is commoner than twins or difficult calvings. Apart from causation by specific infection such as contagious abortion, it seems to happen in young high-yielding cows more than in others. Indeed, an analysis which I made of the life histories supplied with the cows sent to me suggested strongly that three inter-connected factors tended to determine the onset both of retained cleansing and of secondary endogenous infection of the genital tract. These were the age of the heifer at first calving, the length of time between calving and subsequent service, and the yield, especially in the first three lactations.

The indications were that genital disease was likely to develop sooner rather than later if any attempt were made to 'push' young cattle in more than one of these three respects. Thus high yield could much more safely be obtained from a heifer if she did not calve before 30–33 months and was not served again until 120 days calved. A heifer calved at 24 months could not safely be served at 70 days unless her yield was below average, and not invariably even then.

Genetic influence

It must first be emphasized that the views expressed in this article are no more than my own personal conclusions. From the point of view of the farmer and animal husbandry specialist, serious consideration must be given to the hereditary aspects of cystic ovarian disease. It may well prove wise to adopt a long-term policy of not using heifers from cystic dams as dairy replacements, even though they may appear to be desirable animals in other respects. One practising veterinary surgeon in Austria ended up by spending the whole of his time in treating only this disease!

In Sweden attention is already being paid to the incidence of the disease in the daughters of bulls used in artificial insemination. Transmitting bulls get a black mark. Much more research is, however, required on the genetic aspect, and from the nature of the case progress is likely to be slow.

Need for a survey

As regards the conditions precipitating secondary endogenous genital infection, there is great need for a large-scale comprehensive examination of the relationships of calving age, yield, and calving-service interval, bearing in mind the big discrepancy between the average 4½-year herd life of a dairy

cow once she first comes into milk and the 10-year average consistently maintained in certain herds and which should be possible more generally. Such a study must take into full account the fate of every animal involved which gets as far as to produce one living calf. In the Friesland province of Holland a policy has been adopted whereby heifers first calve at 24 months and are not served again until six months calved, and the first lactations are not recorded.

Diagnosis and treatment

From the veterinary angle, it is quite easy for a specialist to diagnose the majority of cases of blocked oviducts within three months of the last calving. One in four may respond to treatment given at the same time; in most cases a prognosis that future breeding will be hopeless can be given at the first examination, thus saving a lot of time and money. Diagnosis of the remaining quarter of oviduct cases remains as a research problem. Owners of seriously affected herds find it pays to have a routine veterinary examination of each cow one month after calving. Secondary endogenous infection can then often be diagnosed successfully and treated while still restricted to the womb.

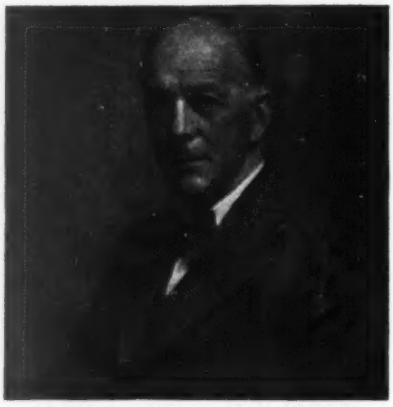
The question arises whether any case of cystic ovarian disease ought ever to receive veterinary treatment. If treatment is held to be justified there is much that can be done; recent research has put many new shots against this condition in the veterinarian's locker, especially if he is called early in the course of the disease. Perhaps three cases in four can be cured.

I would say, in conclusion, that the milked-out, prematurely aged, discard cow is not an economic source of beef. With the surging growth rate of world population it seems certain that neither a short cow herd-life nor the present rate of loss from permanent infertility can be afforded much longer.

F. L. M. Dawson, M.A., Ph.D., B.Sc., M.R.C.V.S., is Assistant Veterinary Investigation Officer (Sterility) at the Ministry's Veterinary Investigation Centre at Cambridge. Since 1953 he has been engaged mainly on a long-term experiment on causes of infertility in cattle. He is at present on an engagement with FAO to assist with similar experimental work in Israel.

A MAN OF KENT

The Story of Sir Thomas Neame



Sir Thomas Neame, M.A., V.M.H.

O. G. DOREY

G. H. GARRAD, in his *Survey of the Agriculture of Kent*, when discussing the origins of fruit growing in the county, writes: 'Richard Harrys, fruit grower to King Henry VIII, might well be regarded as the Father of Commercial Fruit Growing in Kent because in 1533 he imported from the Low Countries "cherry grafts and pear grafts of divers sorts" and planted them on some land belonging to the King in the parish of Teynham between Sittingbourne and Faversham'. This orchard is still known as 'Newgardens' and lies at the centre of the North Kent fruit area on the fine loams which are to be found there. Nearby, on these same fine loams, are the farms of Thomas Neame Ltd., at Macknade, Faversham, inheriting all that is sound from the past and developed by good practice, scientific knowledge and business acumen into a pre-eminent example of a modern Kentish fruit farm.

Forty years in the business

Sir Thomas Neame, now past his mid-seventies, joined the family business in 1919. His father, Frederick Neame, and the generations preceding were farmers whose history is traced back in East Kent to the fifteenth century. In 1909 the arable and hop farm was planted with apples and pears, but Thomas Neame, unrestrained by his father, joined a steel firm and was, until 1914, working with Stewart and Lloyd Tube Works after spending two years in Germany.

In the early part of this century growing fruit for market was still close to garden practice, little advice was available except from the market salesman, and the impact of research and scientific study had still to be realized.

During the 1914–18 war Geoffrey Neame, brother of Sir Thomas, was killed, and at the end of the war, not without some reluctance, Sir Thomas gave up his career in industry and returned to help his father farm at Macknade. He has never regretted this step, to the lasting benefit of the family business, the commercial fruit growing industry and horticulture in general.

Thomas Neame was educated at Cheltenham College, and Gonville and Caius College, Cambridge. He served in the First World War in the 9th Battalion, Worcestershire Regiment, and was wounded in Gallipoli. He was Chairman of the Governing Body of East Malling Research Station from 1945 to 1960. He is a member of the Governing Bodies of Wye College and the John Innes Institute and is on the Council of the Royal Horticultural Society. He is a trustee of the Royal Agricultural Society of England, was Master of the Farmers' Company 1958–59, and was High Sheriff of Kent 1948–49.

Sir Thomas has also served on a number of Government committees, and was for some years on the Agricultural Improvement Council. The R.H.S. awarded him the Victoria Medal of Honour in 1953, the highest award within their power to grant and coveted by horticulturists. He was knighted in 1960.

Macknade

Some of the best fruit-growing land in Kent is to be found on either side of the London to Canterbury road. At Macknade there are some deep brickearth soils which, combined with a 22-inch rainfall and a good aspect, provide some of the finest fruit-growing conditions to be found in this country.

When Thomas Neame joined his father in 1919 the cherries were under grass grazed by sheep, the apples and pears were cultivated, closely planted, hard pruned, and pest and disease control was less exacting than the complex manoeuvres of the present day. The Comice pears were not cropping well at that time, and his father decided to grub them. But at his son's request they were granted a year's reprieve. They cropped well the following year and through the years have grown to be unrivalled in competitions, have yielded profitable crops, and have earned a reputation for Sir Thomas which is acknowledged by all pear growers.

Support for research

In that same year (1919) the Wye College Fruit Research Station at East Malling, which started in 1913 (now celebrating its Jubilee Year), bought a further 40 acres of land and became an independent institute. The findings of this Institute and those of Long Ashton at Bristol were to influence profoundly fruit growing methods in succeeding years. Sir Ronald Hatton's work on rootstocks and that of Professor Tom Wallace on nutrition were great forward strides in knowledge which benefited practice.

Sir Thomas, in company with other progressive growers, eagerly seized on this new information and applied it, but he was also imbued with a strong desire to further the interests of research. In 1928 he was appointed to the

old Committee of Management at East Malling at the same time as Spencer Mount (another pioneer of Kentish fruit growing). He succeeded Mount as Chairman in 1944 and remained so until he retired in 1960. He is still a co-opted member of the Executive Committee. Sir Thomas was a sound financial adviser, wise in his guidance and counsel, and would drop in frequently to discuss work in progress with the research staff.

His interest in fruit is deep and by no means purely commercial. The shelves of his study are lined with old publications and historical records of fruit and Kentish farming. In his garden he has a quite exceptional variety collection, and his exhibits at the Royal Horticultural Society are still winning him Gold Medals. As a member of the Council of the John Innes Institute and in his long service as Chairman of the National Fruit Trials Committee, he made a unique contribution in bringing together in his mind and in his judgments knowledge gained on the breeding of varieties and their testing for practical use. Macknade lies within sight of the National Fruit Trials at Brogdale.

Lead in marketing

Between the wars there came a great expansion in apple and pear orchards. The new knowledge coming from the research institutes was applied, production methods improved, and attention turned to good grading and packing to meet competition and capture the interest of the buying public. The Imperial Fruit Show epitomized this voluntary and prodigious effort. It was the show-piece of the year, home-grown and British Empire fruit competing with each other on the same stands. Growers from all parts gathered to discuss and exchange ideas, and the public in all our major cities saw the fruit. The names of Neame and Spencer Mount from Kent, and of Seabrook and Granger from Essex, will be remembered as strong competitors by those who knew these times. Sir Thomas remembers vividly and justifiably the year 1931 when he swept the board, and his apples 'glowed' with a finish and colour which stood out in the dull expanse of Manchester's exhibition halls.

After the last war Sir Thomas pioneered two ventures: an expansion of his farms to a total of 900 acres, which they are today, and the creation of a marketing organization to reap the full benefit of improved production and to draw like-minded growers into a self-rewarding community effort.

About 40 per cent of the North Kent area is planted with fruit, and all the best land has long since been used. Sir Thomas had always wanted to try his hand at fruit growing under less favourable conditions than at Macknade. So he planted land at Newlands, Charing, over the 400-ft contour, on clay-with-flints. Strong winds, a higher moisture content, and less favourable soil conditions have certainly thrown down a challenge, and profits are more dearly earned.

East Kent Packers Ltd.

Much has been written and said on the subject of marketing; less has been accomplished. But in commercial fruit growing some successful co-operative organizations in the newer fruit-growing areas of Essex and Sussex had become established. Sir Thomas saw the need for similar developments in Kent.

In 1947 he took the chair at an informal meeting of fruit growers held in Canterbury, and subsequently fifteen growers agreed to become members of East Kent Packers Ltd. When the packing station first started in the summer of 1949, it handled apples and pears from 1,500 acres. The Directors comprised seven leading growers who, with Sir Thomas as Chairman, have guided expansion of the group to its present size as the largest organization of its kind in Europe—some say in the world.

Thirty acres at three sites in Faversham are occupied by grading rooms, ranks of refrigerated stores, a juice canning factory, railway siding and vehicle maintenance shops. Nearly a million of money has been spent and a million bushels of English apples and pears are put through the organization, in addition to rehandling jobs on citrus and other fruits and food products to maintain labour the year round and fully utilize the assets.

Sir Thomas is always the first to acknowledge the energy and drive of the Manager, Mr. G. W. Stewart, who has contributed so much to the unrivalled position of this great business.

In 1961 a further step forward was taken when Home Grown Fruits Ltd. was formed (owing much to the inspiration of Mr. J. W. S. Mount and Mr. Stewart). This is an organization for defining and controlling the grading standards and sales of fruit from ten leading packing stations and growers, including East Kent Packers, and accounts for 20 per cent of this country's dessert apple production.

Cycle of effort

The creation of East Kent Packers is a tribute to the leadership, inspiration and business ability of Sir Thomas. It completes the cycle of effort in his life for the good of commercial fruit growing, first refining and expanding production from the family business, then standardizing and promoting a quality product, and finally creating an organization to market and present it on a scale so far unsurpassed.

Despite this preoccupation with the business of fruit growing, Sir Thomas has yet retained a love of fruits in their infinite variety, and is indeed dedicated to this absorbing interest. It must be a great satisfaction to him to have his two sons beside him in the business, carrying on the traditions so soundly laid.

O. G. Dorey, B.Sc., is Deputy Director of the South-Eastern Region of the National Agricultural Advisory Service and is stationed at Wye, in Kent. He was previously Regional Fruit Specialist and Adviser in the Eastern Region of the N.A.A.S.

Research Spot

Some items of interest from the Plant Breeding Institute, Cambridge, whose Annual Report for 1961-62 is now available

Cereals

Potatoes

Sugar Beet

MORE barley is now being grown than wheat and oats combined. Two new spring barley hybrids, Maris Baldric and Maris Badger, have been produced by the Plant Breeding Institute, Cambridge. Although both varieties are of malting quality, it is significant that Maris Badger is higher yielding than Proctor and thus compares very favourably in this respect with any variety on the N.I.A.B. Recommended List, while the better straw and improvement in certain malting quality characters should give this variety added value. Maris Badger also has resistance to loose smut because of its 'closed flowering' habit, and it carries a genetic factor for resistance to powdery mildew. Maris Baldric has also shown tolerance to the wild oat herbicide barban—a character of interest and practical significance.

Considerable interest has been focussed on the Plant Breeding Institute's winter wheat hybrid TB 106/40, derived from a cross between Holdfast and Cappelle-Desprez. This hybrid, which has a field performance roughly equivalent to Cappelle-Desprez, and the milling and baking quality of Holdfast, is one of the highest yielding, baking-quality wheats that has been in N.I.A.B. trials. An initial stock of seed has been grown.

Among the established wheat varieties, it is suggested that Cappelle-Desprez will keep its place as the most popular winter wheat, in spite of the potentially higher yield of Professeur Marchal, which does not seem likely to gain wider favour with farmers.

Potatoes

Potato improvement is seen in the Plant Breeding Institute's two second-early varieties, Maris Peer and Maris Page. The former, commended by the Dept. of Agriculture for Scotland, was released this year; the second one will probably be available next year. Maris Peer matures early, is immune

to wart, the tubers are resistant to blight, the foliage less so, although considerable. It is also fairly resistant to common scab.

Maris Page has had good field reports and promises well in its resistance (tuber and foliage) to blight; it is resistant to common scab and immune from wart disease.

The establishment of a Research and Development Committee by the Potato Marketing Board is emphasizing the part that breeding work can play in helping to solve the problems arising from tuber damage due to mechanical harvesting and bulk handling, as well as the matter of changed consumer requirements resulting from developments in marketing methods and in processing.

Sugar beet

The bolting-resistant variety Camkilt, which has been bred at the Institute as a replacement of Cambro, has given most satisfactory results in its extended field trials. It was outstanding in 1962, a year of high bolting in commercial crops. This variety is now being officially recommended for general use as the most suitable variety for early sowing. In N.I.A.B. yield trials in 1960–61, Camkilt had sugar yields as good as, or slightly above, the average of the varieties in commercial use, and on average six per cent greater than Cambro. In N.I.A.B. bolting observation trials during 1960–62, Camkilt always had the lowest percentage, whether of early bolters counted at the end of July, or of total bolters counted in September. At all counts the next best variety had at least twice as many bolters, and the worst had five to ten times as many.

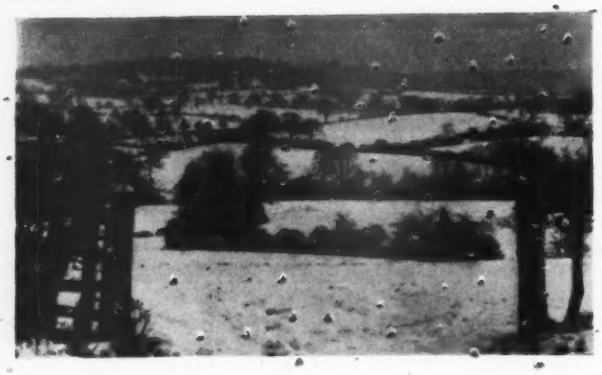
The Institute's Annual Report is available from Maris Lane, Trumpington, Cambridge, price 5*s*. 6*d*.

'Grasshoppers' Farm Buildings Scholarship

THE 'Grasshoppers', a group of south country farmers, are making an award of a Farm Buildings Scholarship tenable for the next three years. The successful applicant will spend a year at Cambridge under the Supervision of Dr. David Sainsbury and then, if a permanent farm buildings centre is established on the Royal Show site at Stoneleigh Abbey, he may be attached to this centre for the last two years of his studies.

The details of the scholarship have been worked out between the 'Grasshoppers' and the Farm Buildings Association, from whom further particulars can be obtained. It is likely that the scholarship will be concerned with the preservation and feeding of grass products or the storage and feeding of wet grain, both fields requiring a great deal of study, but the exact field of study will not be laid down until the successful candidate has been appointed and is able to put his own views forward.

Remember this ?



Winter Damage to Grass

H. K. Baker • G. L. David

You will hardly need reminding that the latter part of the unusually severe winter of this year was characterized by a long period of snow cover followed by marked daily fluctuations in temperature. By the beginning of March it was evident that a good many swards throughout the country had been damaged. Damage ranged from the normal browning or winter 'burn' of the older leaves of some tillers, to complete death of all the tillers of a large proportion of the plants in the swards. Frequently, damage could be related to species and variety of grass, and in some cases to previous management.

A country-wide survey was made, and an investigation carried out at the Grassland Research Institute, with a view to isolating some of the factors involved.

Species

Italian and hybrid ryegrasses were the two types most severely affected. The extent to which perennial ryegrass survived depended upon variety, age, grazing management and fertilizer application. Meadow fescue generally overwintered fairly well. There were very few reports of killing in cocksfoot, but this species certainly lacked vigour in the spring. Timothy and S.170 both overwintered remarkably well and were among the earliest grasses to grow this spring.

There was very little kill of either white clover or lucerne, and both grew vigorously after the thaw. Rye overwintered successfully and proved very valuable this season for early grazing.

Varieties

In the grass species which suffered there were differences between varieties; these were generally marginal but they did indicate a difference in survival rate which might prove important in less severe winters. In Italian and hybrid ryegrasses it appeared that the varieties which had been bred on the Continent (particularly from Denmark and Holland) tended to be more winter hardy; they had a slightly higher survival rate of both plants and tillers. But it must again be stressed that this better resistance was marginal: for example, in situations where swards of Maritime varieties such as S.22 or New Zealand Italian ryegrass were so severely damaged that they had to be ploughed and reseeded, so too were the Continental types. With these reservations in mind, it can be stated that the varieties which were least damaged were Roskilde, Mommersteeg and Combi Italian ryegrasses, and those which were more susceptible included S.22, New Zealand and Irish Italian ryegrass and H.1 short-rotation ryegrass.

Within the perennial ryegrasses the pattern of susceptibility was generally similar to that in the Italians. Again, the Continental types were somewhat superior to the Maritime varieties. In addition, the early-flowering types tended to be more susceptible than the late varieties. This could be seen where swards of S.23 and S.24 were grown next to each other under similar managements. Generally the S.23 was more resistant. It was consistently reported that the tetraploid variety 'Reveille' had overwintered extremely well and gave a very full sward in the early spring.

Age of sward

Age had a marked effect on the susceptibility of Italian ryegrass swards. For the most part Italian ryegrasses sown direct, either in the spring of 1962 or earlier, were completely killed. The survival of swards sown between spring 1962 and mid-August varied a good deal and appeared to depend upon the autumn management imposed on them. Italian ryegrass sown between mid-August and late-September invariably appeared to have overwintered well. Swards sown after September varied, complete winter kill and complete survival both being reported. A greater proportion of Italian ryegrass swards undersown in spring 1962 overwintered better than those sown direct.

Although perennial ryegrass was not so badly affected, the same general trends with age could be observed. Swards sown in the period mid-August to late-September invariably came through the winter successfully. Generally, the older the ryegrass ley the greater was the incidence of killing.

Grazing management and fertilizer application

The effects of management and fertilizer treatments were mainly noticeable in the ryegrass swards and were obviously closely interrelated. When nitrogen was applied at 200 lb N per acre or less per year, winter kill appeared to be greatest on swards which carried a large amount of leaf through the autumn, whether it was subsequently taken into the winter or not. At nearly all centres, those swards which were frequently utilized on a rotational basis

throughout the autumn, overwintered the best. There were, however, individual reports of swards with a lot of top growth which were not damaged. The reasons for this are not yet clearly understood.

At very high levels of nitrogen (over 300 lb N per acre per year) damage increased with increasing nitrogen, and kill was reported even when the swards were well utilized in the autumn. There were also indications that under some high nitrogen regimes imbalance of mineral nutrients may have accentuated the damage.

Effect of snow

Many swards were found which appeared to have survived fairly well when the snow melted at the end of February but were killed in the following two weeks during periods of fairly bright sunshine followed by intense cold at night. It was also reported that more damage during this period occurred on south-facing than on north-facing slopes.

In the north of Scotland, where depth and duration of snow cover varied, the following points were noticed regarding Italian ryegrass:

1. It was killed by prolonged spells under deep snow.
2. It was killed by prolonged periods of exposure to extreme cold with little or no snow cover.
3. It survived in cases where snow was present for some time and was not followed by a long, cold spell.

Emerging points

Several practical points emerge from last winter's results. The most certain method of ensuring early bite in the spring from Italian ryegrass is to sow it between mid-August and late-September the previous autumn. In all ryegrass swards it is important to utilize the herbage on a rotational basis during the autumn, so that there is not a complete canopy of herbage for any appreciable period from the end of September onwards. At very high levels of nitrogen (300 lb or more N/acre), damage may occur on ryegrass swards even when well utilized. Timothy, S.170 tall fescue, rye and the legumes have all shown a remarkable degree of winter hardiness. Finally, it should be remembered that although kill has been very marked under the extreme conditions of the past winter, it probably also occurs to some extent in less severe winters and may be a factor in the deterioration of leys.

Most of the data for this report have been provided by grassland and other technical officers of official and commercial organizations in Britain. To these and other colleagues at Hurley, we wish to express our sincere thanks.

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P. G. Wrixon describes a system designed to produce a carcass of over 450 lb at twelve months of age or less. This is achieved on a predominantly concentrate ration, with a high proportion of barley

Yearling Beef

THE AUTHOR

COMPARED with other methods of beef production, a highly intensive system offers certain advantages. The grass acreage required is nil. There is a quick turnover of money and a low labour requirement. Farmyard manure is a valuable end-point for some, and the profit margin is easily measured. Finally, the product is easily recognizable at the point of sale by the creamy colour of the fat, and the meat will certainly be tender and succulent.

Against this must be set the housing requirements for the job, also the higher risk of losing beasts from bloat and diseases associated with intensive housing. The system is less satisfactory for heifers than for steers, since they have an appreciably slower growth rate and tend to get over-fat.

Costs and returns

It is impossible to give figures that will apply to all farms, so the safest approach is to consider the gross margin over food costs and then see what items this figure must cover and whether this leaves a net margin. Assuming that barley is available on the farm and is valued at £21 per ton rolled, the feed costs are likely to be:

	£	*s.*	*d.*
28 lb milk replacer @ £5 per cwt	1	5	0
3 cwt calf cudlets @ 37*s.* 6*d.* per cwt	5	12	6
5¼ cwt beef supplement pellets @ 42*s.* per cwt	10	15	6
24 cwt rolled barley @ 21*s.* per cwt	25	4	0
Hay (approx. 3 cwt) plus glucose and antibiotic (say)	2	0	0
	£44	17	0

This will produce a bullock with a carcass weight of around 480 lb, which at 2*s.* 9*d.* per lb returns £66 2*s.* 6*d.* This, together with the calf subsidy, gives a gross return of £75 7*s.* 6*d.*

The gross margin over feed costs is therefore likely to be about £30. For every 1*d.* per lb above 2*s.* 9*d.*, the gross margin increases by £2, and for every £1 per ton rise in the value of barley the margin decreases by 25*s.*

Charollais × Friesian calves take food from under the slide of an ad lib. hopper

Out of this figure must come the cost of the calf, labour, housing and marketing; also an allowance for veterinary charges, mortality and the appropriate management overheads. Since some of these items are complementary to each other and all of them are highly variable from farm to farm, it is as well perhaps to examine next the method of production. This should make it possible to assess what the variable costs are likely to be for individual farms.

Choice of calf

It has been demonstrated that the bigger breeds usually have a higher growth rate potential. Though a high growth rate is an advantage, feed conversion is also important. Better food conversion, however, is usually associated with the faster growing breeds. The difference in carcass value as between Friesians and the other breeds has rarely been more than 1½*d.* per lb dead weight (equivalent to £3 per beast). This would suggest that so long as Friesian calves of suitable type are available, the premium paid for other breeds or crosses for this particular system should be strictly limited.

Rearing the calf

The early weaning system has proved very satisfactory for rearing calves for this purpose. Apart from being a simple and economic method, it has the added merit of getting calves on to relatively high quantities of dry feed at any early age—and this is what is wanted. Comprehensive instructions for this type of rearing are readily available from many sources, but success still eludes many a would-be calf rearer. Intelligent individual attention can still pay good dividends in calf rearing. The increasing practice of selling calves at three months of age on a weight basis is to be encouraged, since it will tend to confine the initial rearing to those who are most skilled in doing it. But there is one danger here. Our records indicate that if a calf is not 200 lb at twelve weeks of age it is probably unsuitable for the intensive system. Prospective buyers may need to know age as well as weight.

Calves will thrive under a wide range of housing conditions provided they have a dry bed and are in well-ventilated but draught-free conditions. Individual penning is preferable, since it allows far greater scope in management and recording and it prevents vices like navel sucking from developing. This is important where calves are going on to be grouped in large numbers in a small area and particularly if they go on to slats.

Regarding the question of castration, recent work suggests that under present conditions there is little point in delaying this to beyond 3 months of age.

The question of precautionary measures to combat disease must be considered. One's own vet is the best person to consult in the first instance, but if calves are carefully bought and adequately housed this should never be a big problem. It is wise, nevertheless, to allow a figure of £2 per head in the costs to cover the cost of veterinary treatment, mortality and insurance.

Changing to barley

By three months old, calves should be feeding *ad lib.* on good quality calf nuts. Friesian calves should average around 220 lb live weight at this age and will probably be eating about 7 lb of concentrates per day plus a pound or so of hay.

The introduction of barley into the ration has now to be considered. Experience has taught us that this must be a very gradual process. This change-over period should not be less than three to four weeks. If the change is made too quickly scouring will result, and in extreme cases coma and death can follow. It must be mentioned here that where the same proportions of barley and supplement are cubed, there seems to be no problem in change-over at all.

The type of feed hopper suitable for this system must have some kind of adjustable slide to restrain the flow of food into the feed trough. Ideally the trough itself should always be empty and clean, and the cattle should be made to lick out the food from under the slide. This prevents waste from soiling. Proprietary metal hoppers vary considerably in their ability to prevent waste. The simple wooden hopper illustrated was made on the farm

Close-up of hopper and slide, as used on Mr. Wrixon's farm

for under £5 and is quite adequate, provided it can stand outside the pen. Suspended metal hoppers of a good design are preferable where they have to be inside the pen.

Barley varies considerably in protein, fibre and moisture content, with appreciable influence on the feeding results. Though much remains to be learned, present knowledge may be summed up as follows. Where cattle are on slats or sawdust, barley of a moisture content of over 16 per cent, lightly bruised or cubed whole, will go a long way towards preventing bloat. Where cattle have access to hay or are bedded on straw, barley of much lower moisture contents can be used safely and advantageously.

The supplement

Supplement to supply the extra protein requirements together with the necessary minerals and vitamins can be made in various concentrations. The usual aim is to mix it with the barley to provide a ration having a crude protein level of about 15 per cent for calves up to 500–550 lb live weight and of about 13 per cent for the finishing period. A supplement in pellet form has several advantages; it mixes easily in a hopper and flows well through a small slide aperture. It is also more difficult for cattle to be selective.

Food conversion and killing weight

We know that food conversion is much more favourable in the two- to six-month-old stage than it is later. To get a beast from 250 lb to 500 lb requires about 10 cwt of feed at £25 10*s.* per ton—about 1*s.* per pound gain. To take the same beast from 500 lb to 850 lb, may require 20 cwt of feed at £24 10*s.* per ton (lower protein content), but this has cost nearly 1*s.* 5*d.* per pound gain. Within the limits of market requirements, the earlier the

Friesian bullocks in a general-purpose building with straw-bale wall

beast is marketed once it has exceeded 450 lb dead weight, the more economic it is likely to be.

Regular weighing in conjunction with feed recording helps in checking the performance of a group. Just as a guide, some groups of our own cattle varied in conversion between 5·27 and 5·60 in tests measured from 250–850 lb live weight. This difference represents about £2 worth of food between the best and the worst. Put in a different way, the worst converters would have to be worth about 1½*d.* more per lb dead weight to make them as profitable as the best converters. We are of course striving all the time to improve conversion rates by producing better rations. In this connection the use of maize as an alternative to barley, or as a partial substitute, shows some promise.

Housing affects performance

There is no doubt that housing can affect performance, but little positive information is as yet available. We think that food conversions are better where cattle are warmly housed, though growth rates do not seem to be affected very much. The best size of a group is uncertain, but provided the cattle are closely matched for size and 6 inches of trough space allowed per beast, groups of up to twenty have performed well. Space per beast can be as little as 20 sq. ft on slats and up to 50 sq. ft where straw is available and the dung is required. A minimum of one ton of straw per beast must be allowed.

Ventilation is important, because virus pneumonia can spread through intensively-housed calves very quickly. Our own rather rough-and-ready method has been to use a Dutch barn with straw-bale walls and to remove the top bales as circumstances demanded. This may seem excessively crude, but the cost of a fully controlled environment house for beef cattle would be over £30 per beast—nearer £50 per beast if slats were used. Since the whole system of intensive beef production relies at present on the availability of cheap cereals (relative to the price of beef), it is doubtful whether such expenditure can be justified commercially at present. It also remains to be seen to what extent performance can be improved under fully controlled conditions.

Another question yet unanswered is whether it is better to have a continuous performance house or a 'batch in and a batch out' system. Provided suitable marketing arrangements can be made, the latter is probably the safer course.

Does the system pay?

Having discussed some of the factors which affect production, it is clear that the question whether it pays can only be answered according to individual circumstances. Are suitable calves available and at what price? Can existing housing be cheaply modified to house the cattle, and what value is the dung? Is there a suitable outlet for the beasts at the time when they are likely to be ready? If so, what is the price likely to be? The answers to these questions will show what net margins can be expected on your farm.

P. G. Wrixon, B.Sc.(Agric.), Manager of Spillers Experimental Demonstration Farm, Middle Aston, has been associated with the Company's many beef feeding trials covering various breeds and crosses over a number of years.

Haute Couture in Farm Buildings

What the model girl wears with glamour
may be a little out of place
on an unsophisticated country girl

John Foster

FARMERS who expect their wives to be too practical to be interested in the whims and fantasies of Balmain and Balenciaga are not averse themselves to admiring the latest line in farm buildings. And there is certainly no lack of publicity for farm building fashions.

Most farm building developments today are intended to save labour or to introduce an artificial environment aimed at improving the performance of stock or cheapening the cost of their management. Back in the 'thirties those pressures did not apply. Labour was cheap, farming methods were based on nature rather than science, and the farmer got by in difficult times by tightening his belt.

In this atmosphere new designs in farm buildings were not in demand. Most building improvements were in charge of Land Agents. Improvement, too, was often a misnomer; usually it was a case of rebuild as before or add some more boxes or another implement cover. What pride there was in such work was limited to satisfaction with the excellence of the construction or perhaps the way a new building fitted into the countryside.

A few double-range cowsheds and the Scandinavian piggery were almost the sole advances, and the latter was usually unsatisfactory because the important elements of the Danish pig houses had not been properly understood. There was one other building which even before the war was becoming ubiquitous—the Dutch barn. But this was about the extent of the change over very many years.

Shopping in 'Bond Street'

Today there are many farmers who are owner-occupiers of big acreages. They rely little on the profession of land agency to help them, and still less do they submit to any attempt by that profession to persuade them to proceed with caution. These men do not distinguish between their roles as farmer and landowner. Farm profits may be used to speculate in capital investment for the land, in the knowledge that the return on the money in the form of more farm profits will probably allow the investment to be written down over a short period. Rewards for productivity are much greater, labour is far dearer, science is the farmer's friend. Everything encourages the successful farmer to experiment with his buildings if there is a chance he can save labour or increase productivity by the application of science.

Besides these owner-occupiers, there are companies supplying farmers with their cattle food, fertilizer and chemical requisites that are running big experimental farms. They recognize not only their value to agriculture but also the benefit to themselves in goodwill and good publicity to be gained from developing new ideas in farm buildings. A few firms selling prefabricated buildings to agriculture have developed original designs. Educational establishments, too, may have on their staff the building enthusiast who has an opportunity of testing out his ideas.

Glamour out of place

These then are the Diors, the Givenchys and the St. Laurents of farm building fashions. They produce the new creations and, quite often in the glare of arc lights, they are presented to the farming public. Unfortunately the anxiety to keep up with the Joneses and the brilliance of the presentation blinds the farmer to the fact that what the model girl wears with glamour may be a little out of place on an unsophisticated country girl. And if it is altered to fit her figure it may well lose most of its good points and retain only the rather bizarre adornments which are neither beautiful nor useful.

There are thus two difficult problems to solve, and they must be recognized as such. Do these 'Paris models' really merit serious consideration? Are the ideas behind them worth while? Are they just gimmicks? Is the value of the publicity to their producer worth more than the practicability and profitability of the building to the user. It is a big problem this, to sort out the grain from the chaff, to judge the sausage and not the skin. That is one problem.

The other is to decide whether the ideas can be adapted to the economy of a particular farm. Farms are certainly as varied as is the human figure. What is ideal for one may be totally unfitted to its neighbour. In the glamour with which these new ideas are often presented, it is easy to forget how carefully each new building ought to be tailored to the needs of the farm it is to serve.

In their infinite variety

The number and variety of farm building ideas which have broken upon the agricultural scene in the past ten years or so are pretty astonishing when compared with the lack of ideas in the first half of the century. Controlled environment broiler houses have settled down to a fairly definite pattern.

There are a multitude of pig houses, each with a neat label bearing the name of its originator—the Solari, the Horvat, the McGuchian, the Jordan. These are but a few of the piggeries made famous by their inventors.

Cows have had their full share of attention. Parlours in a variety of styles are definitely the vogue, though the fairly recent advent of pipeline milking is giving a new look to the outmoded cowhouse. The 'Bed-and-Breakfast' system (Messrs. Colman, Prentis and Varley could hardly have thought of a more telling catch-phrase) of bedding cows on top of the silage to which they help themselves down below had great publicity a few years ago. The latest things in cow comfort are saucer-shaped cubicles lined with sawdust. This rage, which started in Cheshire, is now being copied in the home counties and elsewhere.

One of the best publicized fashions in recent years has been the slatted floor. Its advantages have been extolled from many platforms; and it is fair to add that a few brave souls have spoken of the disadvantages. Tower silos and auger feeding with push button controls—it might be a washing machine being advertised on the 'telly'—are being installed by many of the best people. Grain drying and storage 'on-the-floor' is perhaps the latest addition to the list of new ideas in farm buildings—except of course that it is a system probably used by the Romans. Its advocates claim for it great reduction in cost compared with other methods and the possibility of general purpose use for the building—a claim which is often difficult to substantiate in practice. The cost, too, comes perilously near to costs of other methods if the walls are built to an adequate specification to retain the grain.

The Land Agent—a steadying influence

The Land Agent ought still to have a place in all this, and indeed he has. But his is not usually a role in the spotlights. Almost traditionally he has accepted the role of 'buffer'. He has in the past eliminated the friction, occasionally the head-on collision, between landlord and tenant, between his principal and the outside world, and between competing demands for land from forestry, agriculture and development.

In this world of farm building fashion it is his job to leaven a little the enthusiasms of the fashion creators, to translate good ideas into terms of practical application over a wider sphere and to steady a little the mad rush to copy every new idea. His job is to remind the farming public constantly of what they seem to forget—that buildings are not only costly to erect but once created they cannot be sent to a jumble sale like last year's outmoded coat.

Like all steadying influences, the profession gets no great credit for carrying out this task. The farmers say: 'But we are practical farmers; how can you set your wisdom and experience against ours?' The Land Agent is not trained for nothing and he does not do his job without acquiring a good deal of practical experience. Of what? Of conditions, of requirements and of capabilities on a multitude of farms. He doesn't blow his own trumpet enough. Too little notice is taken of his opinion. Amongst farmers it is too easy to have accepted this cry of 'I am a practical farmer', to which should normally be added the qualification 'but with experience of one farm only'.

. . . and a trained buyer

The Land Agent sees the *whole* market for farm building fashions; he is the buyer who can see which new designs or accessories will suit the mass market. Snap judgments are not reliable. It would be better if new buildings could be tried out on farms and their merits properly weighed before too much publicity is given to them. The 'fashion shows' would benefit agriculture more if they were of last year's models, which had at least been used long enough for a semi-mature judgment to be exercised. Today's system is more suited to the ladies' whims than to the farmers' needs.

Before the war, **John D. Foster, B.Sc., F.L.A.S., A.A.I.,** was an agricultural auctioneer and Land Agent in Worcestershire. He went into the Army in 1939 and was subsequently seconded to the R.A.F. as a pilot. He later became Deputy Executive Officer of the Cumberland W.A.E.C. and, after three years, joined the Ministry's Agricultural Land Service. Since 1957 he has been Land Commissioner for Worcestershire, Warwickshire and Herefordshire.

Whose Ditch?

C. Robinson

Agricultural Land Service, London

IF, as is said, good fences make good neighbours, then it is probably right to claim that better ditches make even better neighbours. Which brings us to the question of who owns the ditch.

Most people in farming come up against this question sooner or later. So long as the land is draining freely and the water getting away along the ditch there is no problem, but let there be an obstruction somewhere along the line and there is soon a hue and cry to find out why and what is going to be done about it!

And as always when it comes to doing something or spending money to get something done, few people want to own the subject of the labour or the expense unless it brings some return to themselves. So we have to fall back on old-established principles to decide the ownership in so far as this can be done by physical examination. Though this method is fairly reliable, it is only an indication and not conclusive evidence.

In the absence of other evidence, the legal presumption is that the ownership of a ditch goes with the ownership of the hedge alongside. This is based

on the age-old assumption that when the boundary was formed the owner of one field dug the ditch on the extreme edge of it, throwing up the soil on to his own land, as he must to avoid a trespass on to his neighbour's land, and thereafter planting a hedge on the mound so formed.

This is a simple method but it should not be relied upon absolutely, for the Court of Appeal in 1939 decided in a particular case (Fisher *v.* Winch) that the boundary of ownership was the centre line of the hedge and so in that case the ditch did not belong to the owner of the hedge. This situation arose because the conveyance of the land related the boundaries of it to the Ordnance Survey maps, which are measured up to the centre of the hedge.

In special cases, for instance where there is a ditch on each side of a bank with or without a hedge, or a ditch with a bank on each side of it, then evidence of acts of ownership give a fairly reliable guide. If it can be shown that a neighbour has done work on a ditch over a period, this is a good starting point for deciding the ownership. This rule applies also to the ditch having not a hedge but a fence alongside it. But even this evidence can be overridden by title deeds, though they seldom go into such fine detail as ownership of ditches unless these have special importance or value to particular land.

Roadside ditches

Roadside ditches are special cases, and whether they form part of the highway or not depends upon circumstances. The Chancery Division of the High Court in 1938 in Handscombe and Others *v.* Bedfordshire County Council decided where there is a ditch the presumption is that it does not form part of the highway. This rule may not apply if the road has to be a specified width under an Inclosure Award and the ditch has to be included to make up this width.

Even if such a ditch is not part of the highway, should it become filled up so that the public can pass along it freely, and it can be shown that the public has exercised a right to pass along the line of it without interruption by the owner, it may become part of the highway by what is termed 'implied dedication'.

All this adds up to the conclusion that the ownership of ditches is a knotty problem, and not one to be resolved by a hasty decision based on the evidence of one's eyes. It can happen that a ditch belongs not to the owner of the land on either side but to the original owner of that land where it has been sold in lots and neither purchaser has taken a title to the ditch. In the fens, where hedges and fences are rare and ditches are of supreme importance, such a situation produces an interesting and at the same time frustrating situation.

(An article on the allied problem of boundary fences appeared in our December, 1962, issue.)

Brian Hanson

Looking after your Birds

1. The Husbandry Aspect

THE more intensively poultry are kept, the greater and more serious is the risk of disease and the build-up of parasites. Every poultryman should have some plan to reduce the risk of infection entering his premises and some idea how he will deal with it should it arise.

Before new houses are built, thought should be given to the distance they can be placed from main roads, other poultry farms and from each other. Two distances which have been suggested are: 100 feet from public highways and 1,000 feet from poultry on adjacent premises. About 40 feet between the houses is sufficient to prevent the direct spread of mycoplasma (P.P.L.O.) by air currents and this is probably sufficient for most bacterial diseases too. But experience with fowl pest has taught us that this virus infection can be airborne over greater distances, due to the very heavy rate of infection quickly produced by large numbers of birds under intensive conditions. The direction of prevailing winds is therefore another factor to be considered when planning a site.

Right conditions in the house

A discussion of the relative merits of the various types of poultry houses and equipment is beyond the scope of this article, and would have to be dealt with by an expert in that field. The same applies to the various systems of ventilation, but two general principles may be stated. It is important that extremes of temperature and humidity are avoided, and it is essential that all equipment and fittings can be easily dismantled and cleaned and that their use does not add any form of stress to the birds.

In future, greater use is likely to be made of air filters, although as a means of disease control they do have certain difficulties. For example, a filter which is sufficiently small to keep out micro-organisms is likely to become blocked and require changing frequently. If filters are added to a house which has been built before this fitment was considered, some compensation

for the alteration in ventilation will be necessary, otherwise the addition may *encourage* an outbreak of respiratory disease rather than prevent it.

Earth floors have little to recommend them except cheapness, and this may be false economy. Any control of environmental conditions will be limited if the house has an earth floor, since it will form a constant source of humidity spreading through the litter. The result can be damp litter with a consequential harmful effect on the humidity and temperature of the house. Furthermore, the litter on an earth floor soon becomes sufficiently humid to encourage the development of coccidial oocysts until they become a potential danger, whereas in dry litter they may have remained dormant and never have reached the infective stage. Intestinal worms are encouraged by damp litter, and most of the cases where blackhead disease has reached serious proportions in broilers have occurred in houses with earth floors. An earth floor also makes complete disinfection of the house more difficult.

For similar reasons it is important to select a good type of water container and place them so that splashing is reduced to a minimum—on wire-covered stands, for example. Even a fairly small area of damp litter can act as a source of coccidial infection which, if it does not build up into a general outbreak of coccidiosis, can result in debility and more culls.

The necessity to control rats and mice needs no emphasis, and most poultry keepers are aware of the expense of feeding wild birds. The role of the latter as disseminators of disease is difficult to estimate. A considerable number of diseases affecting poultry have been diagnosed from time to time in a wide variety of species. Circumstantial evidence has led to the suspicion that several outbreaks of pasteurellosis in turkeys may have originated from infected vermin and birds. But it is the risk of birds acting as indirect carriers of disease on their feet and feathers which is greatest and makes it desirable that wild birds should be kept out of poultry houses.

Each house self-contained

Each house should be regarded in some measure as a separate flock, and it should be kept as self-contained as is practicable. As few people as possible should enter the houses, and on some plants this is ensured by keeping the doors locked and limiting the number of persons possessing keys. It should not be necessary, for example, to have people going into the houses to deliver food. Where an attendant has several houses under his care, the minimum requirements should include disinfection of boots on entering and leaving, and a scrubbing brush should be placed beside each trough. The casual dip is of little value. It is important too to keep the disinfection solution fresh, as the presence of organic matter soon reduces its effectiveness. The use of a separate coat for each house would be commendable.

Young and old apart

Where *stock of various ages* are kept, it is sound practice to keep the younger birds and the older ones as far away from each other as possible. Apart from anything else, this is one of the few practical steps that can at present be taken in the control of leucosis, and in any event it helps to prevent exposing young birds to chronic respiratory infections. If it is decided to move young stock to a building previously occupied by older stock, the question may arise whether or not the litter should be changed. Experience with the previous batch will provide some guidance, but it must be borne in

Regular blood testing of breeding stock ensures freedom from pullorum disease

mind that although the previous batch may not have shown any clinical manifestations of disease, there may have been a certain amount of infection, and the younger stock entering the building may not have developed a sufficient immunity to withstand it.

It is probably unnecessary to say that chicks should always be bought from sources where the breeding stock is regularly blood tested to ensure freedom from pullorum disease. It would be sheer folly to do otherwise.

Whenever possible all chicks that are to be reared together should come from the same source. When chicks from several different hatcheries are mixed or brought in close contact, there is always the chance that cross infection with some disease such as salmonellosis may occur. Moreover, different groups of chicks may possess varying degrees of resistance or susceptibility to disease—for example, neural lymphomatosis. They may also have slightly different nutritional requirements and growth rates. Such differences are likely to produce an unevenness, make the flock more difficult to manage and lead to an increased rate of culling.

Care with new birds

The addition of fresh birds to the adult laying flock is risky. Cases are not uncommon where stock cockerels have developed pasteurellosis or wattle cholera soon after their introduction into the breeding pens, whilst the hens show no symptoms at all, and none has previously been noted. Birds which have become established may have developed sufficient immunity for them to be living with a mild respiratory condition or a certain degree of coccidial infection. But fresh birds may be susceptible, develop symptoms and increase the degree of infection until the resistance of the established birds is overcome and disease becomes widespread. Alternatively, fresh stock may include carriers of fowl typhoid or infectious laryngo-tracheitis and introduce disease where none existed.

In laying flocks it is important to provide adequate nesting boxes and to keep them supplied with clean nesting material. Outbreaks of salmonellosis, yolk sac infection, reduced hatchability, rotten eggs bursting in incubators

and some cases of aspergillosis frequently owe their origin to infection picked up in the nest boxes. Fumigation and germicidal dipping may be used to control these problems, but it is cheaper in the longer run to prevent them. This can be done by changing nesting material frequently, before it becomes a source of infection, and by providing sufficient nest boxes so that birds are not tempted to lay their eggs on the floor.

Next month Brian Hanson will be dealing with the disease angle

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The Ministry's Publications

Since the list published in the July, 1963, issue of *Agriculture* (p. 341) the following publications have been issued.

LEAFLETS

Up to six single copies of Advisory leaflets may be obtained free on application to the Ministry (Publications), Government Buildings, Block C, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit much be purchased from Government Bookshops (addresses on p. 408), price 3d. each (by post 6d.)

ADVISORY LEAFLETS

No. 349. Spring Cabbage (Revised)
No. 521. Red Currants (New)

OTHER PUBLICATIONS

Experimental Horticulture No. 9 (New) 7*s.* (by post 7*s.* 6*d.*)

This number covers a range of subjects from glasshouse crops to fruit, vegetables and flowers.

Experimental Husbandry No. 9 (New) 6*s.* 6*d.* (by post 6*s.* 11*d.*)

Contents include the results of recent experiments on manuring of potatoes, grassland and fodder roots, ewe management and a performance test of beef bulls.

British Livestock Breeding: The Way Ahead (New) 15*s.* (by post 15*s.* 6*d.*)

Report of the Proceedings and Discussion at the Harrogate Conference, November, 1962.

FREE ISSUES

Obtainable only from the Ministry (Publications), Government Buildings, Block C, Tolcarne Drive, Pinner, Middlesex.

A Career in the N.A.A.S. (Revised)
Code of Clean Milk Practice (Revised)
Grants for Ploughing Grassland (Revised)

7. Aberystwyth, N. Cardigan

J. D. Gwynn Jones

THE Aberystwyth District resembles a triangle whose base runs from Llanrhystud on the coast, through Trefenter on the northern face of Mynydd Bach to Cwmystwyth in the hills, and whose flattened apex is Cwm Llyfnant, which opens on to the estuary of the river Dyfi a few miles south of Machynlleth. Below Aberystwyth the hills form the background to an undulating lowland, but above Talybont they have asserted their authority to such an extent that there is little level ground, apart from the large tract of bogland near Borth, Cors Fochno. Inland from the sea the ground rises steadily between the numerous river valleys which cut it at intervals, forming ridges of land of varying width running up into the high plateau.

Most of the locality lies on Silurian rocks, with the exception of the Plynlimon massif and an outcrop alongside the estuary of the river Dyfi, which consist of Ordovician rocks. Plynlimon Fawr, which forms both the backbone to, and the eastern boundary of the district, is just under 2,500 ft and near its summit are the sources of three rivers, the Rheidol, the Severn and the Wye. The hills of North Cardiganshire abound with old lead mines and their working led to a measure of economic prosperity, enabling the area to escape the period of agrarian discontent which culminated in the Rebecca Riots further to the south. Even a cursory inspection of gravestones in any old mining village, however, serves as a grim reminder that this stability was dearly bought.

The soils of the lowland are generally light to medium loams, often liable to drought and of only moderate fertility. On the other hand, a clay subsoil sometimes overlain by peat, is common in some localities. In the uplands the soils are generally thin, leached of lime and abounding with rocky outcrops, while peat bogs lie in the hollow of the hills.

The rainfall varies from 35 inches on the coast to 100 inches at the top of Plynlimon and reflects the contrast in climate between the coastal lowland and the hills.

Dairy farming is important throughout the lowland but it is often coupled with a certain amount of rearing, which increases with altitude. A Friesian herd in a tied cowshed is the general rule, but a few farmers have adopted loose housing. Oats is still a very popular crop and surveys have shown that, on many farms, milk is produced at a low cost per gallon. The number of milk producers continues to dwindle, however, as farmers, faced with a shortage of labour or the need for additional capital outlay on buildings, return to what is often their traditional calling of rearing.

The interdependence of lowland and upland provides the key to an appreciation of the farming systems. Fat lamb production runs milk a close second on the larger lowland farms, and has even replaced it as the main enterprise on many where shortage of labour is acute. Draft Welsh Mountain ewes are crossed with a Down ram, often a Suffolk, and retained for one or two seasons. The smaller dairy farms, however, often take in ewe lambs from hill farms for overwintering.

Milk production gives way entirely to rearing in the valleys radiating from Penrhyncoch, Talybont and Eglwysfach, where Welsh Black cattle and Welsh Mountain sheep come into their own. In the uplands of Ponterwyd, Devil's Bridge and Cwmystwyth, Hereford cattle and speckled-faced hill ewes predominate. The sales of draft ewes, store lambs and store cattle which are held at Talybont and Devil's Bridge in the autumn, are widely known.

The large sheep walks beyond the head of the valleys behind Talybont are run in conjunction with lowland farms, but smaller rearing farms, with no hill of their own, often send ewes to summer there as well. This practical method of realizing the potential of hill land has a great deal to commend it, for the heavy summer stocking is wintered on several farms and the small farmer's economic stability strengthened. It could well be undermined, however, by an extensive tree planting programme in the neighbourhood.

Wintering the flock is the hill farmer's main concern and with limited low ground in relation to hill, he has rightly continued to send the ewe lambs to a lowland farm, both for their own good and to lighten the stocking at home during the winter. The ewes are generally brought down after the turn of the year, the weaker being moved first, and in hard winters are hand fed.

A plough never rusts in North Cardiganshire, for the proportion of tillage is high, leys being renewed periodically after a rotation that includes a generous measure of corn. In the uplands oats are widely grown for feeding on the sheaf and good pioneer crops of rape, which precede grass and clover seeds, lessen the hill farmer's dependence upon the vagaries of the store lamb trade. Reclamation is in the blood of Cardiganshire farmers, and nowhere in the country has the plough gone so far into the hills. Lime and slag have followed hard on the heels of the plough in establishing and maintaining swards for many years on even the steepest and poorest ffridd.

In most localities full advantage has been taken of the Hill Farming and Livestock Rearing Schemes to rehabilitate holdings and of the Marginal Production Scheme to reclaim rough pasture.

Most farms in the district are small, and when they are on poor land as well, as many are, the difficulties appear insurmountable without an increase in acreage. The impact of the Small Farmer Scheme is very real in most cases but the obstacle of structure often remains.

The Welsh Plant Breeding Station, now at Plas Gogerddan, has long been associated with the farming of the locality, and it comes as no surprise to learn that the first scheme for cereal seed crop certification in Britain was established by the Clarach Valley Seed Growers Association in 1933.

The Ministry's Experimental Husbandry Hill Farm at Pwllpeirian, Cwmystwyth, adjoins Hafod Uchtryd, the former seat of Thomas Johnes, litterateur and pioneer of new methods of farming. Plas yr Hafod is no more, but Johnes lives on in the tradition of land improvement which has transformed the face of North Cardiganshire.

Agricultural Chemicals Approval Scheme

Additions to the 1963 List

THE following additional products have been approved under the Agricultural Chemicals Approval Scheme. The Third List of Approved Products was published on 1st February, 1963.

FUNGICIDES

NABAM—*Powder Formulations*

Dithane A-40—Murphy Chemical Co. Ltd.

HERBICIDES

ATRAZINE—*Granular Formulations* (Total weed control)

Weedex A Granular—Fisons Pest Control Ltd.

ATRAZINE—*Wettable Powders* (Total weed control)

Weedex A—Fisons Pest Control Ltd.

DINOSEB—*Formulations in Oil* (Potato haulm destruction)

Stanhaulm DNBP—S. D. C. Pesticides Ltd.

SIMAZINE—*Wettable Powders* (Total weed control)

Weedex—Fisons Pest Control Ltd.

SEED DRESSINGS

gamma—BHC (LINDANE) LIQUID SEED DRESSINGS

For prevention of damage by wireworm attack in cereals.

Kotol—Shell Chemical Co. Ltd.

The lean-to which forms the covered yard for cattle at Frith Farm

One Man and a Herringbone

R. A. WILLMORE
Agricultural Land Service, Crewe

FRITH FARM, Wrenbury, can be fairly described as a typical Cheshire dairy farm. It is situated on the edge of the Cheshire Plain, famous for its dairy herds and cheeses.

The farm is on a clay subsoil and practically all of its 112 acres are down to grassland. The only tillage crops grown are wheat (mainly for the straw crop as bedding) and kale. The farm policy is concentrated on milk production from a mixed herd of 55 Ayrshire and Friesian cows, and the milk is sold direct to a firm of baby-food manufacturers.

The present occupier, Mr. P. B. Hockenhull, inherited a collection of farm buildings dating from the early nineteenth century. The main range is of a lofted brick-and-tile construction and, although substantially sound, the layout, designed in the days of hand milking, left much to be desired by present standards of working conditions and clean milk production. The shippon accommodation consisted of 'cross-ties' in six ranks of eight cows (see plan opposite). Milking was carried out by two men with three units each and the milk was carried by hand to a dairy behind the farmhouse. In rainy weather milking, feeding and cleaning out were unpleasant tasks, the men often getting soaking wet whilst moving between the shippons.

To reduce labour and production costs and improve labour conditions it became imperative to seek a new type of cattle housing. In 1960 Mr. Hockenhull therefore decided to follow the local trend and adopt a yard-and-parlour system. After much thought it was decided to make use of a yard, already partly concreted, and to house the cattle on straw litter in a covered yard to be erected as a mono-pitch lean-to against the main shippon range. Provision was made for feeding within the yard through a feed barrier.

The selection of a herringbone parlour, at that time a comparative innovation, was viewed by many with suspicion, since it was generally considered

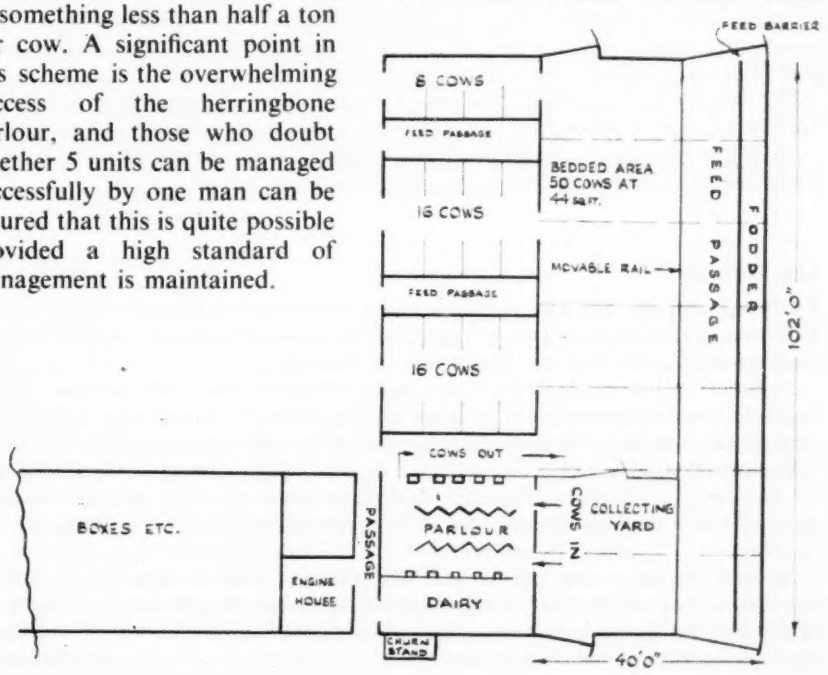
to be suitable equipment only for the larger herds. However, a layout was designed to make use of as much of the existing building as possible without too many structural alterations. A loose box and a shippon for eight cows was converted into a dairy and a 10-stall 5-unit parlour, using an existing feed passage as the exit passage. The parlour is fitted with automatic feeders to each stall, which are fed from the loft above.

At milking time the herd is moved into the collecting yard. One man does the milking, which is completed in a little over an hour, night and morning. Whilst milking is in progress, movable rails are let down to divide the bedded area (to which the cows return) from the feed area. The feed passage is scraped clean by tractor, and fodder is delivered into the feed barrier from a trailer driven along the feed passage. When all the cows have been milked the rails are raised and the herd is allowed access to the barrier.

The cost of the structural improvements, excluding milking equipment, was:

	£
Covered yard, including walls, cladding and gates	1,410
Feed barrier and 15-ft concrete feed passage	290
Parlour and dairy conversion, including stalls	970
	2,670
Grant under Farm Improvement Scheme on eligible items	857
	1,813

The result of this improvement is that Mr. Hockenhull can run the farm with one man and a boy (a reduction of one man) and working conditions are greatly improved. The straw used for bedding last winter was the crop from 18 acres of wheat. Allowing for some used for pigs, this gives a figure of something less than half a ton per cow. A significant point in this scheme is the overwhelming success of the herringbone parlour, and those who doubt whether 5 units can be managed successfully by one man can be assured that this is quite possible provided a high standard of management is maintained.



IN BRIEF

Less Dirt under Cover

Sugar beet from 35 acres on a Fifeshire farm used to be stored in large clamps on a hard surface in the open. Despite cleaning, a good deal of soil still stuck to the beet, especially after heavy rain, resulting in fairly high dirt tares—around 20 lb per cwt. The crop now goes under a covered concrete storage and loading bay, largely built by the farmer, Mr. A. S. Miller, and his son.

Since the covered concrete bay was erected the beet 'dry out' before going through the cleaner-loader and the dirt tare has been reduced by 10–12 lb per cwt. Loading the lorry is done in comfort regardless of weather conditions, the shed being open at either end so that the first beets in can be first out.

The shed measures 90 ft long, 28 ft wide and 12 ft high to the eaves; it is divided into 9 bays each 10 ft wide and was made from material ready to hand. The roof and trusses are wooden sections from an ex-army hut. The steel uprights were purchased from a factory which was being dismantled. New asbestos sheets were bought and erected with the help of a local tradesman for £50 all in. The ex-army roof cost under £100 and the steel uprights £80.

The shed holds more than 200 tons of beet, which is dumped in tractor-bogey loads direct from the harvester and later piled 8–10 ft high with the fore-end loader

When the beet season is over the shed would be ideally suited for storing implements and, with bales at the sides, would make an ideal lambing shed.

Reported in *British Sugar Beet Review*

Kew Diploma

The horticultural training course given at the Royal Botanic Gardens, Kew, is to be improved so that students may be equipped, by the time they leave, to take the final examination for the National Diploma in Horticulture.

Provision will be made in the new scheme to include those who are not able to reach the standard necessary to enter for the final N.D.H. examination but who are, nevertheless, capable of profiting from training approaching that level.

The course is to be extended from two to three years, starting next autumn, and the number of students entering each year will remain at twenty, so that eventually sixty will be in training at one time. There will be one intake only each year—in October.

As hitherto, the course will be basically practical, with teaching mainly 'on the job'. More time will be spent on demonstrations, practical work on plots and at the bench and the number of hours devoted to theoretical tuition will be increased. Most of the lectures will be given during the day instead of in the evening, as now.

Those who complete the three-year course successfully and satisfy external examiners will be awarded a diploma, which will replace the present Kew certificate. This will be the 'Kew Diploma of Horticulture' and those completing the course with distinction may qualify for the 'Kew Diploma of Horticulture with Honours'.

The range of plants grown at Kew is so large and the variety of horticultural skills needed in dealing with them so extensive that it is an ideal place for a young horticulturist to complete his general training. Facilities will be provided in the new course to include training in the growing of vegetables and fruit. Further details of the scheme can be obtained from the Director, Royal Botanic Gardens, Kew, Richmond, Surrey.

Continuous Barley

'For those who have the ability and resources to manage successfully a continuous barley system, it is financially attractive at existing prices, with or without subsidiary enterprises.' So says *M. E. Daw*, writing in the University of Nottingham's *Farm Management Notes*.

One farm in the E. Midlands, of 200 acres on poor sandland, is quoted as having a net farm income of £12 per acre, compared with an average of £7 per acre from sixteen other sandland farms. It has been wholly in barley for the past seven years, one-third of the land having grown sixteen successive barley crops. No measurable effect of pests and diseases has been seen, and indeed during the past three years yields have been increasing. Fertilizer is given generously, and rotary cultivation with deep ploughing is the rule to keep crops healthy and clean.

The system is particularly economical on fixed costs (i.e., those which remain unchanged irrespective of changes in the combination and size of enterprises, such as rent, regular labour, vehicle and machinery depreciation, office expenses and miscellaneous costs). On 200 acres this means a saving of £840 a year. This is the main advantage of the system.

Successive barley crops have long been held to be a forbidden practice, and it may well be that a re-examination of that farming dogma is overdue in the light of modern technical progress. The N.A.A.S. is working on this, to see what limits should be set to this aspect of monoculture.

Eyespot, take-all, cereal root eelworm must be accepted hazards, though held by some to be less than was formerly attributable to them. And loss of soil organic matter, says the author, is less risky now that the combine harvester is leaving more straw and chaff behind than did the binder.

But the system is not without its problems, even on sandy soils. An above-average technical proficiency is most certainly called for.

Chemicals and Carrots

Chemicals are replacing the hoe in our market gardens, so developing what is called the close-row bed system. This technique is being worked on at the National Vegetable Research Station, Wellesbourne, and was exhibited at this year's Royal Show, taking a carrot crop as an example.

The beds are of twelve rows and drilled with 3½-inch spacing between the rows. A contact spray just before the crop comes up kills the weeds, and a post-emergence spray of vaporizing oil keeps them down during the early stages of the crop's growth. Any late weeds are smothered by the dense crop foliage.

The system has the great advantage of complete mechanization—so showing a good saving on labour costs. And to this is added higher yields.

Plant density has its effect on yield and size of the carrot roots, so the correct seed sowing rates to give the required plant density, in relation to soil type and fertilizer application, are of considerable importance in planning to meet market requirements.

A Hundred Farm Fires Every Week

A farm fire every 90 minutes, day and night! What they cost is not known, but last year the total fire losses in Britain were estimated at £55 million. That's about £100 a minute. Put another way, its the same as every man, woman and child in the country throwing a pound note on the fire. Suddenly the picture has become much worse; for the first three months of this year farm fires are estimated to have cost £150 a minute!

Figures from the Fire Research Station for 1961 show there were 3,390-fires in farm buildings in the United Kingdom.

The main cause of farm fires is human failure or negligence. Outstanding were those caused by children playing with matches—750. Smoking is another prominent cause—554 fires.

The dangers of fire from rubbish burning are so obvious and well known that one would think every care would be taken over this frequent farm chore, yet 850 fires were started in 1961 from this cause alone.

There's a lesson in these figures, particularly now when valuable crops—inflammable at that—are being harvested and brought into the buildings. One act of carelessness can destroy a year's work in an hour, to say nothing of damage to the building.

All that's needed is a little more care. Keep children and matches well apart, watch that cigarette end. And when it comes to burning stubbles, remember how easily it can get out of hand.

Remember, too, to check your insurance policy. With changes in production and crop values and particularly the rise in building costs, all policies need to be checked yearly to be sure they adequately cover the risks.

Early Grazing for Calves

What do you do with your autumn-born calves in the spring? Three of the N.A.A.S. Experimental Husbandry Farms (Boxworth, Bridget's and Trawscoed) have been looking at this. If the youngsters can be turned out to grass early instead of either housing them during the spring and summer or turning them out abruptly at the end of May, feedingstuff costs can be reduced appreciably.

The results of a four-year experiment have made it quite clear that, given a reasonably dry spring, the calves can be turned out as soon as the grass starts to grow—even on heavy clay. But it must be done gradually of course.

Even in the wintry conditions of 1958, calves turned out in early March came to no harm, and in each year of the experiment slight liveweight gains were consistently noticed over those of a group kept indoors until the end of May.

Agricultural Colleges

From 1st April, 1964, the administrative responsibility for agricultural colleges in England and Wales will be transferred to the Minister of Education. There will be no change in the arrangements in Scotland and Northern Ireland.

There are five agricultural colleges in England and Wales—the Royal Agricultural College, Harper Adams Agricultural College, Seale-Hayne Agricultural College, Shuttleworth College and Studley College. All are independent colleges. During the past five years four of the colleges have been receiving Government grants.

Central responsibility for farm institutes, which are maintained by local education authorities, was transferred to the Minister of Education in 1959.

Books

The Common Lands of England and Wales. L. DUDLEY STAMP and W. G. HOSKINS. Collins. 42*s*.

The subject of 'common' land strikes an immediate chord in the heart of all readers, whether they be rural or urban dwellers. This is a wonderful book to read steadily or to dip into from time to time. The layout is excellent, with many nostalgic pictures of pieces of common land familiar to many of us. It provides also an excellent blend of two authors who both have the knowledge and the descriptive skill to make their sections good reading.

Dr. Hoskins deals with the historical evolution of our common lands. Dr. Dudley Stamp marshals the detail of individual commons, in order to give as complete a record as possible of the commons which now exist, together with interesting glimpses of the important ones present in each county of England and Wales.

The authors make it clear that this 1½ million acres of common land (part of a larger area in the past) is not public property but rather land in private hands, with many and varied arrangements whereby persons other than the owner have rights of access and of certain types of action thereon.

The presence of such land has been a form of safeguard against various pressures throughout the centuries. It enabled the pains and tribulations of the Enclosure movement to be better endured because of the value of individual and common rights of pasturage and fuel-gathering on such land. It provided a reservoir of land through the Middle Ages, so that more land could be brought under cultivation as the population slowly grew and, as more towns were needed, some could be developed on this sort of land. We must also be thankful that so many of our internal wars of the past were fought on open common land rather than across settled and cultivated farmland.

At times in the past when the food supplies of this country have been threatened by siege conditions, or when the population has threatened to outrun improvements in agricultural productivity, there has been some concern that these acres of common land should prove so difficult to bring under changed systems of use and ownership. But many of us are now grateful that wise and stubborn people in the past prevented the extinction of common rights, because, to an ever-increasing extent, these areas of lowland and upland, where private rights are heavily restricted, are proving to be vital open lungs to the crowded inhabitants of our vast urban areas.

Dr. Stamp, following his detailed account of the major commons, pleads for more accurate knowledge of Britain's common lands. This needs to be put into the context of the rapidly increasing demand for public and private land for recreational purposes. We are rapidly entering an era where land will be increasingly scarce for British people—not so much for the home production of food but rather as a provider of sites for the paraphernalia of urban development and for the recreational needs of its ever-richer and more mobile inhabitants.

Better knowledge is needed of our common land inheritance because its period of greatest use and value lies ahead and not behind us. *G.P.W.*

Veterinary Annual, 1962. Edited by W. A. POOL. John Wright and Sons. 45*s*.

We have already come to expect *The Veterinary Annual* to provide a wealth of information about a wide range of veterinary subjects. The fourth edition is certainly no exception. This valuable publication contains much of interest to the agriculturist, as well as to the veterinary surgeon, presented in special and in review articles.

With the introduction of the quality payment scheme for milk, veterinary surgeons and farmers are conscious of the toll which can be taken by mastitis. This subject is reviewed in a masterly way by C. D. Wilson. He draws attention to the pressing need for a simple but efficient diagnostic technique if effective and practical control measures are to be available. Unfortunately there is, so far, little prospect of being able to immunize cattle against infection by the common mastitis-producing micro-organisms. The importance of staphylococcal

mastitis is correctly emphasized and the difficulty of treating this form of udder infection successfully is stressed.

There is a short but amusing and provocative contribution from the pen of Allan Fraser entitled 'Breeding at the Crossroad', which provides plenty of food for thought. In his usual down-to-earth manner, he once again points out the futility of conventional livestock shows and judging standards, and suggests what should be the aims in livestock improvement. He also comments on the importance of strictly limiting the characteristics to be selected.

The current edition of *The Veterinary Annual* should be required reading for every veterinary surgeon and progressive agriculturist. *S.L.H.*

A West Country Village: Ashworthy. W. M. WILLIAMS. Routledge and Kegan Paul. 30*s*.

There is a good deal of general information available in this country about the farmer and his ways. There is also a considerable, though highly fragmented, literature of detailed or local studies. But, in practice, it is far easier to obtain reliable, systematic information on rural communities in, say, Indiana or Kentucky than on those in our home shires. Any addition to our knowledge of rural society is therefore welcome. It is peculiarily welcome when it comes in a form as comprehensive and penetrating, as sympathetic and enjoyable, as Mr. Williams's study.

Essentially, this is what the Elizabethans would have called an 'anatomy' of the life and work, manners and customs, of the two hundred families of this parish. In part it is historical, tracing the changes that have come to men and land in the last century. In part it is agricultural, for it shows the manner in which systems of management and tenure have been adapted by family farmers to changing needs. In part it is social, an analysis of local institutions, kinship relationships, and what the research workers so neatly class as attitudes. It will interest all concerned with the countryside; above all, those concerned with agricultural administration and advice.

In particular, Mr. Williams shows that land-holding in this apparently simple and static economy is complex and subject to rapid change—55 per cent of the farms have been acquired by the present occupier or his family in the last twenty years, 69 per cent in the last thirty years.

More generally, he has much valuable evidence on such familiar topics as the reluctance of small farmers to hire labour, the cycle of the family farm, the extent of mutual aid by the neighbourly borrowing of machinery, the agricultural ladder, and the effect of newcomers to the district on the prospects of local smallholders and farm workers obtaining a farm.

One criticism, however. The change in the attitude of farmers to education and advice is surely one of the most remarkable developments of recent years. Yet Mr. Williams tells us little about the formal education of Ashworthy farmers, less about their views on it, and nothing of its actual or potential effect on the relationship between father and son. Neither does he mention the N.A.A.S., though presumably there is a District Officer not so far away. Do the farmers consult him or do they regard him, in the delightfully ambiguous phrase of Mr. Gwyn Jones, as 'culturally unacceptable'? On such matters even negative evidence is valuable.

Finally, a suggestion. Mr. Williams has now given us two admirable studies of small farm areas. Could he perhaps increase his experience and our knowledge by a similar report on an area of bigger farms in, for instance, East Anglia? *N.H.*

A Bibliography of Farm Buildings Research Part III—Buildings for Poultry. 1st Supplement. 1958-61. Agricultural Research Council. 4*s*.

No farm livestock has changed as much in this century as the domestic fowl. The 'barn-yarders' disappeared early on, and in 1939 the 'free-rangers' went through lack of food.

As the stock has changed so has the housing; from a roost in a corner of the barn to the modern building with controlled environment is a tremendous leap forward in a relatively short time.

Poultry housing has never been a problem for the landlord. The change from the barn to the housing systems of the 1920s passed him by. Tenants never expected landlords to provide the housing, and a progressive manufacturing industry grew up to provide the farmer with his first prefabricated stock building. Even though present-day housing comes mainly as prefabricated buildings, and is frequently assembled in groups on permanent bases, landlords still leave their tenants to provide it.

As production and housing methods are intensified, the importance of research increases. New husbandry practices produce new problems, and only research can provide the answers. Conversely, research gives a lead to changes in husbandry practice. This combination of science with practice has made possible the huge advances in poultry breeding, management and housing which we have witnessed in the past twenty years.

A bibliography of this kind was long overdue, and its value cannot be exaggerated. This supplement ranges wide in its record of research with a bearing on poultry housing and equipment. Many people seem to think that farm buildings research begins with the building; the fallacy of this is apparent to any thinking individual who studies this bibliography.

The supplement is a worthy addition to earlier parts and, whilst perhaps of little appeal to the general farmer, it has much to offer research workers, poultry-building designers and, of course, advisers in the field of poultry management and housing.

C.R.

Portrait of Cornwall. CLAUDE BERRY. Robert Hale. 18*s*.

Soon after the second world war, Robert Hale Ltd. designed a series of County Books intended to be informative companions rather than topographical guide books. One of the most successful of these, but long out of print, has now been revised and re-presented as *Portrait of Cornwall*.

Being a true journalist, the author is primarily interested in people. This book is about the Cornish, studied against their surroundings and against the rich background of their past.

In few parts of the British Isles can the past pervade the present more than it does in Cornwall, and Claude Berry is highly successful in conveying this atmosphere, ranging out from his well-beloved hometown, Padstow, to survey the whole county. The impact of the sea and the granite uplands, history and tradition, accounts of the old and dying industries of mining and fishing, food and sport are subject headings on which he discourses engagingly.

Those of us interested in Cornish agriculture and horticulture, and believing in their future potentialities, find it disappointing that little more than two pages are devoted to the husbandry of Cornwall, where one in every five persons derives his living directly from the land.

In addition to the remarkable assemblage of facts, an attempt is made to explain the Cornishman. We are told that seven centuries after the Cornish Celts had been subjugated by the English they were still smarting from their defeat. Does something of this smart yet remain, impelling the Cornishman to justify even his most lovable qualities and to regard so much with a wistful look over his shoulder?

The author manages his transitions in masterly fashion moving, for instance in Chapter III, from the Arthurian legend and the Cornish language to the saints, holy wells, crosses and handbells and on to churches, bridges and the Civil War. Such diversity could be served with a more detailed index, for readers will inevitably return to the book to re-acquaint themselves with the vast amount of information which has been woven into a most readable unity of 200 pages.

K.H.J.

Our Developing World. (Paperback Edition). L. DUDLEY STAMP. Faber and Faber. 8*s*. 6*d*.

The problem of population pressure on land is by no means new, but continual appraisal of the situation is necessary. It is changing all the time. Professor Stamp considers it as a geographer.

He deals, first of all, with the future growth of world population. At the present rate of increase of 1·8 per cent a year, world population will double itself in less than thirty years. The chief factor responsible for this increase is improving health services which reduce infant mortality, as well as the control, or even elimination, of once incurable adult diseases. At present it is estimated that there is a little over one acre of land available for settlement and food cultivation for each human being.

But about 4 acres can be regarded as the available potential, and Professor Stamp believes that mankind will not starve—yet. With the extension into the underfed areas of modern food production techniques, he sees an improving situation. Existing knowledge of a technical and scientific nature in land and soil management, crop and animal husbandry can alleviate an otherwise crucial position. Apart from these is the possibility of harvesting much more from the present uncultivated seas and oceans.

These encouraging circumstances may, however, easily be nullified by the creation of political and economic barriers. Professor Stamp sees a possible threat to our own

overseas food supplies by such man-made obstacles.

This book, which was first published in 1960 at 21*s.*, should appeal not only to economists, planners and politicians, but to all concerned with modern world events.

H.E.

Tractors on the Move. FRANK HOLLIS. Odhams Press. 9*s.* 6*d.*

The tractor, to the farmer an efficient tool, is to a boy or girl an attractive and exciting piece of machinery, and it is to the young that this little book is mainly directed. The development of the tractor is traced in a most interesting way. The explanations of machines and of the methods of operating them are clear and sufficient for the purpose, and the author is never boring.

There are sections dealing with the earliest beginnings of cultivation; with the horse, machines and steam power, the petrol and diesel tractor, crawler tractors and robots.

In his fascinating story, the author describes crawler tractors at work on the M1, clearing the Australian outback, making irrigation canals in Egypt, and crossing the Antarctic wastes with Sir Vivian Fuchs's expedition in 1958. There are accounts of demonstrations by three International tractors of 1910 vintage, between them pulling fifty-five ploughs, and of the little sixteen horse-power Mogul of the year 1916.

It is difficult to realize that it is less than thirty years since the modern hydraulic tractor was first used on farms, and yet, recently, a tractor has been made to start, travel across a field and stop without a driver and by remote control. With developments such as this and the fuel-cell-powered tractor, the farmer will have available to him still more advanced techniques.

This story of tractors is also the story of the men who invented them and the companies concerned with their development. It will undoubtedly be enjoyed by all young readers.

A.S.

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